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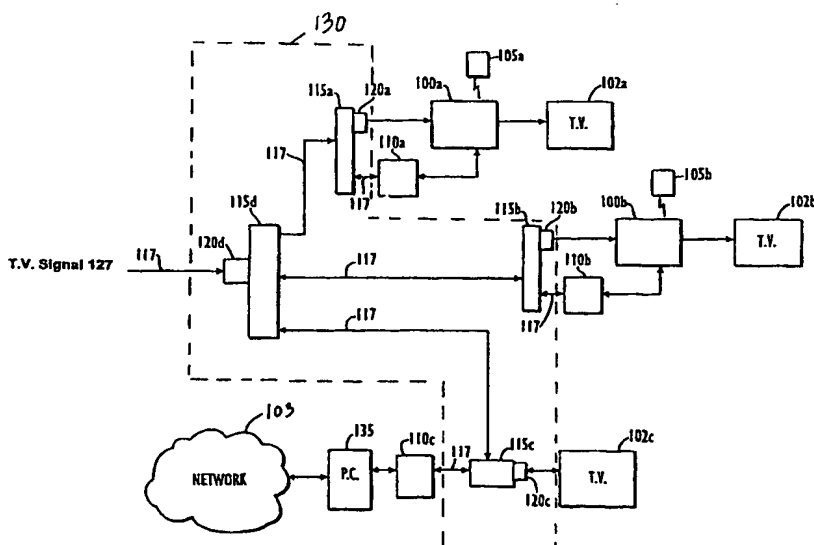
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(54) Title: METHODS AND SYSTEMS FOR PROVIDING INFORMATION TO SET-TOP BOXES HAVING SET-TOP BOX IDENTIFIERS USING FREQUENCY SHIFT KEYING MODULATION



**(57) Abstract**

A set-top box is provided wherein an Identifier (ID) associated with the set-top box can be used to request information from a personal computer which provides the requested information to the set-top box. In particular, in a system that includes multiple set-top boxes, the ID can be used to determine which set-top box made a request and to determine which set-top box is the intended recipient of the requested information accessed by the system. The information can be provided over a cable which is used to connect a television signal. In particular, the information can be transferred using frequency shift keying modulation.

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**METHODS AND SYSTEMS FOR PROVIDING INFORMATION  
TO SET-TOP BOXES HAVING SET-TOP BOX IDENTIFIERS  
USING FREQUENCY SHIFT KEYING MODULATION**

**Field of the Invention**

The present invention relates to the field of communications in general, and more particularly, to data transmission.

**Background of the Invention**

5           The television (TV) has become ubiquitous in modern society. As a result, a variety of services are being provided via TV. Many of the services are provided using a set-top box that works in conjunction with the TV to provide the desired service. One example of a service provided via a TV is an online TV program guide, wherein TV program schedule information is displayed on a TV for searching and selection by a viewer. Online TV program guides are described in U.S. Patent 4,751,578 to Reiter et. al. entitled *System for Electronically Controllable Viewing on a Television Updateable Television Programming Information*. Other popular services are also provided using a set-top box. For example cable or satellite TV may be provided using a tuner packaged as a set-top box. The tuner decodes the transmission from the service provider and  
10           formats the signal for display on the TV. Moreover, many households have more than one TV.  
15

          It is also known to provide some services over the Internet using set-top boxes. One such service is WebTV which enables a user to browse the Web using a TV as the display. WebTV, however, duplicates much of the hardware and software included in a standard PC. For example, WebTV includes a modem while many PCs come equipped with one. Consequently, the consumer who already owns a PC may pay the cost of the modem twice: once when buying the PC and a second time when buying WebTV.  
20           Furthermore, WebTV may also duplicate a portion of the functions found in most TVs.

This duplication of PC and TV components may make WebTV unnecessarily expensive or complex to the many consumers who already own a PC.

As the popularity of TV and services increase, it may become more desirable to provide multiple users in the same household with the capability to use services separately. Unfortunately, the cost to provide multiple TV users separate access to the services described above may be prohibitive. For example, viewers of different TVs may desire separate information.

Furthermore, as the popularity of cable television services increases, new consumer devices may become available for home use. For example, new types of consumer devices such as cable ready televisions, cable tuners, and video cassette recorders may be connected to cabling which carries the transmission of the cable television services for use by consumers in their homes. As the number of consumer devices used in the home increases, the cabling needed inside the home may also increase and become unwieldy. As a result, the cabling may be integrated into the structure of the home, for example in the walls and floors. It is known to use coaxial cable having an impedance of 75 ohms in some cable systems for the transmission of the cable television services.

The cabling may conduct television signals and other signals which include the cable television services, and Direct Current (DC) voltages or Alternating Current (AC) voltages for controlling the consumer devices. For example, a television signal and a DC voltage may be transmitted over the cabling to provide a video signal and a DC voltage for controlling a cable tuner.

Personal Computers also may be capable of communicating with other devices, such as the consumer devices described above. Unfortunately, separate wiring may be needed to provide the communications between the devices. For example, a serial data cable may be needed to connect two PCs. Unfortunately, if the PCs are located in different areas of the home, the serial data cable may need to be long which may make the serial data cable expensive and unwieldy. Therefore, a need exists to further improve methods and systems for providing services via consumer devices and PCs.

30

### Summary of the Invention

It is an object of the present invention to provide improved set-top boxes for use with television services.

It is another object of the present invention to provide improved systems for the  
5 use of multiple set-top boxes.

It is, therefore, an object of the present invention to allow an improvement in the transfer of data between devices within a building.

It is another object of the present invention to allow improvement in transferring data over transmission lines which conduct television signals.

10 These and other objects of the present invention may be provided by set-top boxes, identified by respective identifiers (IDs), that send requests for information to a PC over a television signal transmission line. The request can include the ID of the set-top box that made the request. When the requested information is accessed, the requested information and the ID of the set-top box that made the request can be transmitted over  
15 the communications link to the set-top box using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal on the television signal transmission line. Accordingly, multiple set-top boxes may access information from a single residence via an existing PC, thereby allowing a more cost-effective approach than conventional systems.

20 In one embodiment, a computer program running on the PC can handle requests from the plurality of set-top boxes. In another embodiment, a computer program can be instantiated for each of the plurality of set-top boxes. For example, a first computer program can be instantiated to handle requests from the first set-top box and a second computer program can be instantiated to handle requests from the second set-top box.

25 The frequency shift keying modulation can be provided by generating a modulated data signal based on information included in the data. For example, the frequency shift keying modulation can generate a modulated data signal at a first frequency when the data is equal to a logical 0 and at a second frequency when the data is equal to a logical 1. In one embodiment, the first frequency is about 800KHz and the  
30 second frequency is about 1MHz.

Frequency shift keying modulation may provide a reduction in the cost of transferring data. In particular, the frequency shift keying modulation may be embodied using relatively few components. In contrast, some conventional data transfers are performed using phase shift keying modulation which may be more expensive than a  
5 system according to the present invention.

### **Brief Description of the Drawings**

**FIG. 1** is a block diagram of a first embodiment of systems and methods according to the present invention.

10 **FIG. 2** is an exemplary display of information provided to a user on a TV.

**FIG. 3** is a block diagram of a second embodiment of systems and methods according to the present invention.

**FIG. 4** is a block diagram of an embodiment of a set-top box according to the present invention.

15 **FIG. 5** is a block diagram of an embodiment of a PC according to the present invention.

**FIG. 6** is an embodiment of a packet structure according to the present invention.

**FIG. 7** is a flowchart that illustrates initialization operations of a set-top box according to the present invention.

20 **FIG. 8** is a flowchart that illustrates initialization operations of a computer program running on the PC in coordination with the operations illustrated in **FIG. 7**.

**FIG. 9** is a flowchart that illustrates operations of a set-top box in response to requests for information.

25 **FIG. 10** is a flowchart that illustrates operations of the computer program running on the PC in response to incoming requests for information from set-top boxes.

**FIG. 11** is a flowchart that illustrates operations of a set-top box in response to information broadcast by the PC.

**FIG. 12** is a block diagram of a cable transfer interface according to the present invention.

30 **FIG. 13** is a schematic diagram of an exemplary embodiment of a cable transfer interface according to the present invention.



### **Detailed Description of the Invention**

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which a preferred embodiment of the invention is shown. This invention may, however, be embodied in many different forms and should  
5 not be construed as limited to the embodiments set forth herein; rather these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

The phrase "television signal" as used herein includes signals formatted for display on television sets such as National Television System Committee (NTSC) format  
10 video provided in some conventional cable television systems. NTSC formatted video includes 525 lines at a horizontal frequency of 15.734 KHz and a vertical frequency of 60 Hz. Other signals formatted for display on television also are included. As described herein the phrase "transmit operation" refers to the transmission of data from a PC to a set-top box over a transmission line. Similarly, the phrase "receive operation" refers to the  
15 transmission of data from the set-top box to the PC. Like numbers refer to like elements throughout.

As will be appreciated by one of skill in the art, the present invention may be embodied as a method, data processing system and/or program product. Accordingly, the present invention may take the form of an entirely hardware embodiment, an entirely  
20 software embodiment or an embodiment combining software and hardware aspects. Furthermore, the present invention may take the form of a computer program product on a computer-readable storage medium having computer-readable program code means embodied in the medium. Any suitable computer readable medium may be utilized including hard disks, CD-ROMs, optical storage devices, or magnetic storage devices.

25 The present invention is also described using block diagrams and flowcharts. Those skilled in the art will understand that the blocks in the block diagrams and the flowchart illustrations, and combinations of blocks, may be implemented with various commonly used components. It will also be understood that portions of the operations described in the blocks may be executed as computer program instructions loaded into a  
30 computer or other data processing apparatus, thus producing a machine which provides means for implementing the functions specified in the flowchart blocks and combinations

thereof. The computer program may cause operational steps to be performed on the computer or data processing apparatus to produce a computer-implemented process such that the instructions which execute on the computer or data processing apparatus provide steps for implementing the functions of the blocks or combinations thereof. Accordingly, the blocks support combinations of means for performing the specified functions and combinations of steps for performing the specified functions.

**FIG. 1** is a block diagram that illustrates systems and methods according to a first embodiment of the present invention. According to the embodiment of **FIG. 1**, the system can include a plurality of set-top boxes **100a-b**, each of which accepts requests from respective remote controls **105a-b**. According to **FIG. 1**, a user pushes buttons on the remote control **105a** to request the display of information on a TV **102a**. The remote control **105a** transmits a corresponding command to the set-top box **100a** associated with the remote control. It will be understood that functions of the remote control alternately can be provided directly on the set-top box and/or the remote control can be coupled to the set-top box via means such as a cable, RF coupling and/or IR coupling. The set-top box **100a** can send a request for the information to a Personal Computer (PC) **135** over a communications link **130**. Each set-top box **100a-b** can request different information from the PC **135**, which responds by accessing the requested information locally or via a network **103**, such as the Internet. As used herein, the term "information" includes information such as television program information (such as that shown in **FIG. 2**), e-mail, chat, sports scores, weather and the like. Set-top boxes are discussed in U.S. Patent Application No. 09/005269 entitled *Methods and Systems for Providing Television Related Services via a Networked Personal Computer* which is commonly assigned to the assignee of the present application and which is incorporated herein by reference.

Each request for information by a set-top box **100a-b** can include an Identifier (ID) that identifies the set-top box **100a-b** which made the request. For example, the first set-top box **100a** can be identified by a first ID of  $FF_{16}$  and the second set-top box **100b** can be identified by a second ID of  $F0_{16}$ . Requests sent to the PC **135** by the first set-top box **100a** include the first ID  $FF_{16}$  and requests sent to the PC **135** by the second set-top box **100b** include the second ID  $F0_{16}$ . The PC **135** can use the respective IDs of the first

and second set-top boxes **100a-b** to associate each received request with the set-top box that sent the request.

The PC **135** can access the requested information and can broadcast the requested information and the ID of the set-top box **100a-b** that made the request over the  
5 communications link **130**. For example, the PC **135** can broadcast information requested by the first set-top box **100a** with the first ID  $FF_{16}$  and can broadcast information requested by the second set-top box **100b** with the second ID  $F0_{16}$  over the communications link **130**.

Each set-top box **100a-b** can receive the information and the associated ID  
10 broadcast by the PC **135**. Each set-top box **100a-b** can compare the ID included with the information broadcast by the PC **135** to the ID stored in the set-top box **100a-b**. For example, when the PC **135** broadcasts the information requested by the first set-top box **100a**, the PC **135** includes the first ID. Accordingly, the first set-top box **100a** compares the ID associated with the first information broadcast by the PC **135** to the ID associated  
15 with the first set-top box **100a**. When a match occurs, the first set-top box **100a** accepts the information and provides it to the TV **102a**. Moreover, the second set-top box **100b** compares the ID associated with the first information broadcast by the PC **135** to the ID associated with the second set-top box **100b**. When a mismatch occurs, the second set-top box **100b** does not accept the information.

20 The communications link **130** can be any communications medium known to those having skill in the art. In one embodiment, the communications link **130** can be a cable **117** such as those used to provide cable service to residential customers. Each set-top box **100a-b** and the PC **135** can be electrically coupled to the cable **117** via respective Cable Transfer Interfaces (CTI) **110a-c**. In particular, each set-top box **100a-b** can send  
25 requests for information over the cable **117** through the associated CTI **110a-b**. The PC **135** can receive the requests and can broadcast requested information through the associated CTI **110c**. The cable **117** couples the CTIs **110a-c** to one another through cable splitters **115 a-d**. The cable splitters **115a-d** can be used to distribute an input signal to multiple outputs while maintaining the proper termination for the cable **117**.  
30 Direct Current (DC) blocking circuits **120a-e** can be used to filter DC voltage levels

provided by some cable systems and fed back by some TVs and set-top boxes on the cable 117.

The set-top box 100a can request information by sending requests to the PC 135 and can receive the corresponding information from the PC 135 over the communications link 130 according to a command protocol described herein. User commands received from the remote control 105a are processed by the set-top box 100a to determine what action is necessary to display the desired information. If the requested information is not available within set-top box 100a, the set-top box 100a can send a request for the information to the PC 135. In response, the information requested by the set-top box 100a can be broadcast over the communications link 130 by the PC 135 and can be received by the appropriate set-top box 100a which formats the information for display on the TV 102a.

A request can include computer commands organized to access the information requested by the user via the remote control 105a. For example, the request may comprise a list of instructions which cause the PC 135 to access the network 130 and issue some of the commands included in the request to the network 130. In one embodiment, the access to the network can be provided using a telephone line. In the alternate embodiment of FIG. 3, access to the network can be provided by the cable system via a cable modem 301.

As shown in FIG. 4, the set-top box 100a can include a central processing unit (CPU) or controller 421, a Random Access Memory (RAM) 422, a Read Only Memory (ROM) 423, a Video Processing system (VP) 418, a Video Buffer (VRAM) 419, a TV interface 411, a Communication Link Interface (CLI) 417, and a wireless infra-red (IR) sensor 414. In one embodiment, the ID of the set-top box 100a can be stored in the ROM 423. In another embodiment, the ID can be encoded by switches 450, the settings of which can be read by the CPU 421. The above components are well known to those having skill in the art and need not be described further herein.

The CPU 421 may be suitable for running a computer program to process information from the PC 135, processes user commands from the remote control 105a, control the formatting of information for display on the TV 102a, and provide general system services to the set-top box 100a. The CPU 421 may process user commands

received from the remote control 105a as a stream of serial data. For example, if the user pushes a button on the remote control 105a that corresponds to a command requiring information from the network 103, the CPU 421 receives the command in an internal serial buffer from the IR sensor 415. The CPU 421 sends a corresponding computer  
5 command to the CLI 417 and the command is transmitted over communications link to the PC 135 via the CTI 110a and the network 103. The CPU 421 may also process information from the PC 135. For example, when information is returned from the network 130, it is received by the CLI 417. The CPU 421 accepts the information from the CLI 417 as a stream of serial data. In one embodiment, the CPU 421 may process the  
10 data received from the remote control 105a and information from the PC 135 and the network 103 as a single serial data stream.

The VP 418 may be used by the CPU 421 to combine information from the PC 135 with a TV signal 455 for display on the TV 102a or select between the two for display. The data from the VP 418 may be represented in RGB format wherein a first  
15 portion of the data represents red information, a second portion represents green information, and a third portion represents blue information. The VP 418 may be implemented with a YVG606 Video Processor manufactured by Yamaha Inc.

The wireless IR sensor 414 receives user commands from the remote control 105a. The wireless IR sensor 414 provides the user commands from the remote control  
20 105a to the CPU 421 for processing. The user commands can be processed by the CPU 421 as a serial data stream.

The PC 135 examines the request from the set-top box 100a to determine which set-top box 100a-b is requesting the information. In one embodiment, a computer program running on the PC 135 handles the requests from the set-top boxes 100a-b in an  
25 integrated fashion. For example, the computer program can record each request and the ID of the set-top box 100a-b which made the request in a table or using other techniques known to those having skill in the art. The computer program may cause the PC 135 to access the requested information and broadcast the requested information and the ID associated with the request over the cable 117. For example, if the computer program  
30 determines that the requested information should be accessed via the Internet, the computer program causes the PC 135 to access and request the information from the

Internet. When the requested information is provided to the computer program from the Internet, the computer program looks up the request in the table to determine which set-top box **100a-b** requested the information and broadcasts the requested information and the associated ID on the cable **117**.

5           Requests from the set-top box **100a-b** are handled in view of the context in which the requests are made. For example, if the first set-top box **100a** is presently displaying an e-mail session, subsequent requests are handled in the context of an e-mail session. In particular, the screen being currently displayed by the set-top box **100a** and the keyboard input can be included in the context of the requests.

10           The computer program can combine requests from multiple set-top boxes **100a-b** to the network. For example, if a first set-top box **100a** sends a first request for first information and a second set-top box **100b** sends a second request for second information, the computer program combines the two requests into a single request to the network **130** using techniques known to those having skill in the art.

15           In another embodiment of the present invention, the PC **135** instantiates a plurality of computer programs, wherein each of the plurality of computer programs instantiated is associated with one of the set-top boxes **100a**. In this embodiment, an interface program running on the PC **130** interfaces the plurality of computer programs to the network **130**. For example, in a situation where the first and second set-top boxes  
20   **100a-b** are being used, respective first and second computer programs are instantiated to handle requests from the set-top boxes **100a-b**. Accordingly, when the first and second set-top boxes **100a-b** request information from the network **130**, the interface program coordinates access to the network **103**.

          According to **FIG. 5**, the PC **135** can be a computer capable of running a wide  
25   range of applications software and may include a CPU **542**, a memory **541**, a network interface **543**, a hard disk drive **540**, an interface **531**, a keyboard **539**, a monitor **538** and other hardware and software components commonly found in personal computers. For example, the PC **135** may be implemented using a Pentium microprocessor marketed by Intel running the Windows 98 Operating System marketed by Microsoft Inc. The PC **135**  
30   processes the requests for information received from the set-top boxes **100a-b** over the cable **117** via the CTI **110c**, and accesses the requested information which is broadcast

over the cable 117 through the CTI 110c. In addition, other processing systems such as workstations, mainframes, mini computers, and/or custom systems can be used.

Requests by the set-top boxes 100a-b and information broadcast by the PC 135 can be structured in a packet format as illustrated in FIG. 6. Accordingly, requests for the set-top boxes 100a-b can be referred to as request packets, and requested information broadcast by the PC 135 can be referred to as information packets. The packet format of FIG. 6 can include a START byte, an ID word, an INSTR byte, a LENGTH word, a number of DATA bytes, a CKSUM word, and a STOP byte. The Start byte can signal the start of the packet. In a particular embodiment, the START byte can be the value FF<sub>16</sub>. The ID word corresponds to the ID associated with the set-to box 100a-b. In one embodiment, the ID word can be the least significant word of the serial number of the set-top box.

The INSTR byte can be an instruction or command to be executed by the set-top box 100a. The LENGTH word can be the number of bytes contained in the DATA field. The DATA can be a number of data bytes associated with the INSTR field. For example, if a particular command or instruction has associated data or parameters, the data is stored in the DATA field. The number of data bytes included in the DATA field is described by the LENGTH field. The CKSUM can be the least significant word of the sum of each byte contained in the INSTR, LENGTH, and DATA fields. The STOP byte can signal the end of the packet. In a particular embodiment, the STOP byte is the value FF<sub>16</sub>.

FIG. 7 is a flowchart that illustrates initialization operations of the set-top box according to the present invention. When the user powers the set-top box up (block 700) a self test can be performed (block 705). The ID of the set-top box can be determined and a power-up packet can be sent to the PC (block 715). The power-up packet can signal the PC that the set-top box has been turned on and may provide requests for information. The set-top box can wait for an acknowledgement packet from the PC (block 720). The acknowledgement packet can signal the set-top box that the power-up packet was recognized by the PC.

When the acknowledgement packet is received from the PC (block 725), the set-top box begins processing requests from the user for information to be displayed and begins processing information packets broadcast by the PC (block 730).

5       **FIG. 8** is a flowchart that illustrates initialization operations of a computer program running on the PC 135 in coordination with the initialization operations illustrated in **FIG. 7**. The computer program begins processing incoming requests from the set-top boxes in block 800. A determination is made as to whether an incoming packet is a power-up packet from a set-top box (block 805). If the incoming packet is not a power-up packet, the packet is processed as a request packet from a known set-top box as shown in **FIG. 9** (block 810).

10       If the packet is a power-up packet, the ID associated with the power-up packet is determined (block 815) and the ID is compared to the IDs of all known set-top boxes (block 820). If the ID included in the power-up packet is the same as an ID associated with a known set-top box, operations continue with the processing of incoming request packet (block 810). If the ID included in the power-up packet is not known, the ID is recorded as an ID associated with a known set-top box and a computer program according to the present invention is instantiated (block 825). In particular, request packet from the set-top box associated with the ID included in the power-up packet above are handled by the instantiated computer program. Accordingly, a computer program

15       may be instantiated for each known set-top box. A power-up acknowledgement packet is broadcast on the communications link (block 830) and the operations continue, wherein a determination is made as to whether an incoming packet is a power-up packet from a set-top box (block 805).

20       **FIG. 9** is a flowchart that illustrates operations of a set-top box in response to requests for information. According to **FIG. 9**, the set-top box begins processing input at block 900. The set-top box waits for a command from the remote control (block 910). When a remote control command is detected (block 910), the set-top box determines if the requested information is resident in the set-top box (block 915). If the information is resident in the set-top box, the set-top box sends the requested information to the TV

25       (block 925). If, however, the requested information is not resident in the set-top box, the

30



set-top box sends a request for the information, including the ID of the set-top box, to the PC (block 920).

**FIG. 10** is a flowchart that illustrates operations of a computer program running on the PC in response to incoming request packets for information from the set-top boxes. According to **FIG. 10**, processing begins at block 1000. An incoming request for information is decoded (block 1010) and the ID included in the request is determined (block 1020). If the ID included in the request is not associated with a known set-top box (block 1030), the request is not accepted and processing continues at block 1010.

If, however, the ID included in the request is associated with a known set-top box (block 1030), the request is accepted and provided to the computer program instantiated to handle requests from the set-top box associated with the ID included with the request (block 1040). When the requested information is received (block 1050), the requested information is broadcast over the communications link (block 1060) and processing continues at block 1010.

**FIG. 11** is a flowchart that illustrates operations of a set-top box in response to information broadcast by the PC. According to **FIG. 11**, the processing of incoming packets from the PC begins in block 1100. When a packet is received from the PC (block 1110), the ID included in the packet is compared to the ID of the set-top box (block 1120).

If the ID included in the packet is not equal to the ID of the set-top box (block 1130), the packet is not accepted by the set-top box. The set-top box waits for another incoming packet from the PC (block 1110). If the ID included in the packet is equal to the ID of the set-top box (block 1130), the packet is accepted and the requested information is provided to the TV (block 1140) and processing continues at block 1010.

An embodiment of the cable transfer interface 110a will now be described in greater detail. According to **FIG. 1**, data is transferred between the PC 135 and the set-top box 100a over the transmission line 130, such as a coaxial cable, used to conduct a television signal. The set-top box 100a controls the display of a television 102 in response to commands issued by a user to the set-top box 100a. Some commands may cause the set-top box 100a to request information, such as broadcast times, from the PC

135. In response, the PC 135 may retrieve the information from the network 103 and transmit the information to the set-top box 100a.

Although the embodiment of FIG. 1 shows the PC 135 connected to the set-top box 100 via the transmission line 130, it will be understood that other devices may be used. For example, in another embodiment, two PCs may be connected via the transmission line 130 to allow the transfer of serial data between the PCs. In still another embodiment, the cable transfer interface can be powered by a separate DC power supply.

Data is transferred between the PC 135 and the set-top box 100a in a half-duplex fashion that may be controlled by a computer program running on one or more processors. For example, the PC 135 and the set-top box 100a may each include one or more processors that run computer programs to coordinate the transfer of data over the transmission line 130. In operation, a transmission by either the PC 135 or the set-top box 100a may stop to allow the other device to transmit. The half-duplex control of the PC 135 and the set-top box 100a can be performed according to techniques known to those having skill in the art. The transmission line 130 includes the splitters 115 a-d that distribute the television signal 127 to the plurality of devices via cables 117 as shown in FIG. 1. The transmission line 130 can include conventional cabling such as that installed in the walls and floors of houses.

For simplicity, the transmit operation is described first, wherein data is transmitted from the set-top box 100a to the PC 135 such as when the user requests programming information to be displayed. Second, a receive operation is described in which data is transmitted from the PC 135 to the set-top box 100a such as when the PC 135 responds to the request by transferring the program information to the set-top box 100a.

In the transmit operation, the set-top box 100 can transmit data to the first cable transfer interface (CTI) 110a using an interface format such as an RS-232 serial interface standard, although other interface formats may be used as well. In one embodiment, a 9-pin serial data port on the set-top box 100 can be used to transmit and receive the data.

The first cable transfer interface 110a can process the data received from the set-top box 100 using frequency shift keying modulation to provide a modulated data signal which is transmitted over the transmission line 130 which also conducts the television

signal 127. However, the modulated data signal occupies a frequency range that is not within the television signal frequency range used to conduct the television signal.

The data transmitted by the first cable transfer interface 110a is transferred to the PC 135 through splitters 115a, c, d. The splitter 115d distributes the television signal 127 to the televisions 102a-c, the first and second cable transfer interfaces 110a, c and the set-top boxes 100a-b via the cable 117. Consequently, the cable 117 conducts a distributed version of the television signal 127 and the data transmitted by the first cable transfer interface 110a. Other devices, such as videocassette recorders or other devices known in the art may be used in place of the televisions 102.

A second cable transfer interface 110c can process the data transmitted by the first cable transfer interface 110a to provide data to the PC 135 according to the interface format described above. In one embodiment, a 9-pin serial data port on the PC 135 can be used to transmit and receive data between the PC 135 and the second cable transfer interface 110c.

In the receive operation, data can be transmitted from the PC 135 to the set-top box 100a, such as when the PC 135 responds to the request transmitted by the set-top box 100a. In particular, data can be transmitted from the PC 135 to the second cable transfer interface 110c according to the interface format described above. The second cable transfer interface 110c can process the data to provide a second modulated data signal that is transmitted over the transmission line 130 to the first cable transfer interface 110a. The first cable transfer interface 110a demodulates the data received from the PC 135 and provides data to the set-top box 100a according to the interface format. The set-top box 100a uses the data to control the display of a distributed version of the television signal 127 on the television 102a provided to the set-top box 100a. In another embodiment, the same cable can be used to provide the distributed version of the television signal 127 and the data to the first cable transfer interface 110a and the set-top box 100a.

Accordingly, cabling installed in houses can be used to transfer data between devices, such as PCs and set-top boxes. For example, existing cabling can be used to connect a PC with a set-top box, thereby allowing data to be transferred between the set-top box and the PC. Moreover, the data transfer does not interfere with the television signal conducted over the same cable. The cabling can be installed in the floors and

walls of the house, thereby making the connection between the devices less cumbersome and less expensive than adding a dedicated cable between the devices.

**FIG. 12** is a block diagram of a cable transfer interface **110** according to the present invention. In a transmit operation the data formatted according to the interface format can be received by a converter **200** which converts the received data to Complementary Metal Oxide Semiconductor (CMOS) or Transistor to Transistor Logic (TTL) voltage levels (such as 0-5 volts) to provide a transmit format data signal. A transmitter **205** can process the transmit format data signal using Frequency Shift Keying (FSK) modulation to provide the transmit modulated data signal. The FSK modulation can be performed using a frequency range that is not within a television signal frequency range used to conduct the television signal **127** over the transmission line **130**. For example, in one embodiment the FSK modulation is performed using frequencies in a range between about 800KHz and 1MHz.

The transmit modulated data signal can be provided to a switch **210** that electrically couples the transmit modulated data signal to the transmission line **130** under the control of the data provided to the cable transfer interface **110**. For example, a Ready To Send (RTS) signal included in an RS-232 interface can be used to control the switch direction to electrically couple the transmit modulated data signal to the transmission line **130**.

The transmitter **205** can include an FSK modulator **220** that provides a modulated data signal using a frequency range that is not within the television signal frequency range used to conduct the television signal **127** over the transmission line **130**. The FSK modulator **220** generates the modulated data signal at a frequency based on information included in the transmit format data signal. For example, in one embodiment the FSK modulator **220** generates the modulated data signal at a frequency of 800KHz upon detecting that the transmit format data signal is equal to a logical 0. When the transmit format data signal transitions to a logical 1, the FSK modulator **220** generates the modulated data signal at a frequency of 1MHz.

The modulated data signal is provided to a transmit interface **225** that provides the transmit modulated data signal to the switch **210**. In particular, the transmit interface **225** drives the transmit modulated data signal over the transmission line **130** via the switch

210 to compensate for a variety of transmission line 130 configurations. For example, the transmit interface 225 may drive the transmit modulated data signal over a 200-foot transmission line 130 with an impedance in a range between about 25 ohms and 75 ohms.

5 In a receive operation data is transferred over the transmission line 130 to the switch 210 which electrically couples the data from the transmission line 130 to receiver 215 under the control of the data provided to the cable transfer interface 110 to provide a receive modulated data signal. For example, a Ready To Send (RTS) signal included in an RS-232 interface can be used to control the switch direction to electrically couple the data from the transmission line 130 to the receiver 215.

10 The receiver 215 processes the receive modulated data signal to provide a demodulated data signal to the converter 200. In particular, the receiver 215 processes the receive modulated data signal using FSK demodulation over a frequency range that is not within a television signal frequency range used to conduct the television signal 127 over the transmission line 130 to provide a receive format data signal.

15 The converter 200 converts the receive format data signal to the interface format as described above. For example, in one embodiment the receive format data signal can be converted from CMOS voltage levels to RS-232 voltage levels.

The receiver 205 can include a receive interface 230 that matches the impedance of the cable transfer interface 110 to the transmission line 130 to provide a receive  
20 modulated data signal. For example, in one embodiment, the receive interface 230 can provide a 75 ohm termination for the transmission line 130. The receiver 205 also includes an FSK demodulator 235 that provides a demodulated data signal using a frequency range that is not within the television signal frequency range used to conduct the television signal 127 over the transmission line 130 to provide the demodulator data  
25 signal. For example, in one embodiment the FSK demodulator 235 generates a logical 0 upon demodulating the modulated data signal at a frequency of 800KHz. The FSK demodulator 235 generates a logical 1 upon demodulating the modulation data signal at a frequency of 1Mhz.

30 FIG. 13 is a schematic diagram of an exemplary embodiment of a cable transfer interface 110 according to the present invention. According to FIG. 13, data can be transmitted to/from the cable transfer interface 110 via connector 300. The data is

converted to/from CMOS voltage levels from/to RS-232 voltage levels by an interface format chip 305 such as a MAX232CWE marketed by Maxim, Inc. The CMOS level data is processed by the FSK modulator 310 to provide a transmit modulated data signal. The FSK modulator 310 may be a Monolithic PLL XR0215ACD marketed by Exar, Inc.

5       The transmit modulated data signal is driven over the transmission line 130 by the transmit interface 225. The transmit interface 225 can include a transistor Q1 and resistors R14 and R15 in an emitter follower configuration. The emitter follower configuration can allow the transmit interface to drive the transmit modulated data signal over the transmission line 130 up to 200 feet at an impedance in the range of about 25  
10   ohms to 75 ohms.

      The transmit modulated data signal can be provided to a switch 320 which couples the transmit modulated data signal to the transmission line 130 during a transmit operation. The switch 320 may be an analog switch PI5A383AW marketed by Pericom, Inc. The switch 320 also can couple data from the transmission line 130 to FSK  
15   demodulator 325 via the receive interface 230 during a receive operation to provide the receive modulated data signal. The direction of the switch 320 is controlled by an RTS signal generated at pin 9 of the interface format chip 305. For example, the RTS signal indicates that a device is ready to send data. Accordingly, the direction of the switch 320 is set to receive data from the device sending the RTS signal.

20       The FSK demodulator 325 can demodulate the receive modulated data signal to provide a demodulated data signal. The FSK demodulator 325 may be a Monolithic PLL XR0215ACD marketed by Exar, Inc. The demodulated data signal may have an amplitude of about 200mV.

      The demodulated data signal can be compared to a reference voltage (controlled  
25   by potentiometer R32) by the comparator 330. The comparator 330 shifts the voltage level of the demodulated data signal to CMOS voltage levels to provide the receive format data signal. The comparator 330 may be a Voltage Comparator LM311M marketed by National Semiconductor, Inc. The receive format data signal is provided to the interface format chip 305 for conversion to RS-232 voltage levels upon which data is  
30   transmitted over the connector 300.

Accordingly, cabling installed in houses can be used to transfer data between devices, such as PCs and set-top boxes. For example, existing cabling can be used to connect a PC with a set-top box, thereby allowing data to be transferred between the set-top box and the PC. Moreover, the data transfer does not interfere with the television  
5 signal conducted over the same cable. The cabling can be installed in the floors and walls of the house, thereby making the connection between the devices less cumbersome and less expensive than adding a dedicated cable between the devices.

In addition, set-top boxes can be identified by respective IDs. The set-top boxes can send requests for information over a communications link to a PC. The requests can  
10 include the ID of the set-top box that made the request. When the requested information is accessed by the PC, the requested information and the ID of the set-top box that made the request are transmitted over the communications link to the set-top box. Accordingly, multiple set-top boxes may access information from a single residence via an existing PC, thereby allowing a more cost-effective approach than conventional systems.

15 In the drawings and specification, there have been disclosed typical preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the following claims.

**What is Claimed is:**

1. A method of providing information from a personal computer to a set-top box over a television signal transmission line, the method comprising the steps of:  
receiving a request for information from the set-top box at the personal computer, wherein the request includes an ID that identifies the set-top box;  
5 accessing the requested information by the personal computer; and  
transmitting the requested information and the ID that identifies the set-top box from the personal computer to the set-top box over the television signal transmission line using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal over the television  
10 signal transmission line.
2. The method of Claim 1 further comprising the steps of:  
receiving a second request for second information from a second set-top box at the personal computer, wherein the second request includes a second ID that identifies the second set-top box;  
5 accessing the second requested information by the personal computer; and  
transmitting the second requested information and a second ID that identifies the second set-top box from the personal computer to the set-top box over the television  
signal transmission line using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal  
10 over the television signal transmission line.
3. The method of Claim 1, wherein the step of transmitting comprises the step of transmitting data from a first device to a second device over the television signal transmission line which simultaneously conducts a television signal.
4. The method of Claim 2, wherein the step of accessing comprises the steps of:



accessing the first requested information based on a first context associated with the first set-top box; and

- 5        accessing the second requested information based on a second context associated with the second set-top box.

5.        The method of Claim 3, wherein the step of transmitting comprises the steps of:

- generating a modulated data signal at a frequency that is based on the data; and  
transmitting the modulated data signal from the first device to the second device  
5        over the television signal transmission line.

6.        The method of Claim 2, wherein the step of accessing comprises the steps of:

- combining the first request for information and the second request for information at the personal computer; and  
5        accessing the first requested information and the second requested information by the personal computer via a network.

7.        The method of Claim 4, wherein the step of accessing comprises the step of accessing the first requested information by the personal computer based on a first keyboard status and a first screen status.

8.        The method of Claim 1, wherein the step of transmitting comprises the step of broadcasting a plurality of information packets by the personal computer over the television signal transmission line using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television  
5        signal over the television signal transmission line.

9.        The method of Claim 1, wherein the step of accessing comprises the step of accessing the requested information by the personal computer via a network.

10. The method of Claim 1 further comprising the steps of:  
sending a power-up packet including the ID of the set-top box from the set-top box to the personal computer over the communications link from the set-top box;  
recording the ID of the set-top box included in the power-up packet at the  
5 personal computer to designate the set-top box as known; and  
transmitting an acknowledgement packet including the ID of the set-top box from the personal computer over the communications link to the set-top box to acknowledge receipt of the power-up packet from the set-top box.
11. A method of providing information to a set-top box over a communications link, the method comprising the steps of:  
receiving a request for information from the set-top box, wherein the request includes an ID that identifies the set-top box;  
5 accessing the requested information; and  
transmitting the requested information and the ID that identifies the set-top box over the communications link.
12. The method of Claim 11 further comprising the steps of:  
receiving a second request for second information from a second set-top box, wherein the second request includes a second ID that identifies the second set-top box;  
accessing the second requested information; and  
5 transmitting the second requested information and a second ID that identifies the second set-top box over the communications link.
13. A method of providing information from a personal computer to a set-top box over a communications link, the method comprising the steps of:  
receiving a request for information from the set-top box at the personal computer, wherein the request includes an ID that identifies the set-top box;  
5 accessing the requested information by the personal computer; and  
transmitting the requested information and the ID that identifies the set-top box from the personal computer to the set-top box over the communications link.

14. The method of Claim 13 further comprising the steps of:  
receiving a second request for second information from a second set-top box at the personal computer, wherein the second request includes a second ID that identifies the second set-top box;
- 5       accessing the second requested information by the personal computer; and  
transmitting the second requested information and a second ID that identifies the second set-top box from the personal computer to the set-top box over the communications link.
15. The method of Claim 14, wherein the step of accessing comprises the steps of:  
accessing the first requested information based on a first context associated with the first set-top box; and
- 5       accessing the second requested information based on a second context associated with the second set-top box.
16. The method of Claim 14, wherein the step of accessing comprises the steps of:  
combining the first request for information and the second request for information at the personal computer; and
- 5       accessing the first requested information and the second requested information by the personal computer via a network.
17. The method of Claim 15, wherein the step of accessing comprises the step of accessing the first requested information by the personal computer based on a first keyboard status and a first screen status.
18. The method of Claim 13, wherein the step of transmitting comprises the step of broadcasting a plurality of information packets by the personal computer over the

communications link, wherein at least one of the information packets includes the ID that identifies the set-top box that requested the information.

19. The method of Claim 13, wherein the step of accessing comprises the step of accessing the requested information by the personal computer via a network.

20. The method of Claim 13 further comprising the steps of:  
sending a power-up packet including the ID of the set-top box from the set-top box to the personal computer over the communications link from the set-top box;  
recording the ID of the set-top box included in the power-up packet at the  
5 personal computer to designate the set-top box as known; and  
transmitting an acknowledgement packet including the ID of the set-top box from the personal computer over the communications link to the set-top box to acknowledge receipt of the power-up packet from the set-top box.

21. A set-top box that interfaces to a television and requests information from a personal computer over a communications link, wherein the set-top box is identified by an associated set-top box ID, wherein the set-top box transmits requests for information and the set-top box ID to the personal computer and receives the information and an  
5 associated ID from the PC over the communications link.

22. The set-top box of Claim 21, wherein the set-top box accepts the information from the personal computer if the received associated ID identifies the set-top box.

23. The set-top box of Claim 22, wherein the set-top box rejects the information transmitted by the personal computer if the received associated ID does not identify the set-top box.

24. The set-top box of Claim 21, wherein the communications link is a coaxial cable.

25. The set-top box of Claim 21, wherein the set-top box is configured to be coupled to the personal computer in a house.

26. A system that provides information over a communications link, the system comprising:

5 a set-top box, configured to be coupled to a television, wherein the set-top box transmits requests for information intended for display on the television, wherein the set-top box has an associated ID that identifies the set-top box; and

a personal computer, configured to be coupled to a network and to the set-top box via the communications link, wherein the personal computer receives the requests for information from the set-top box, accesses the requested information and transmits the requested information and the ID associated with the set-top box to the set-top box.

27. The system of Claim 26, wherein the personal computer receives second requests for information from a second set-top box, wherein the second requests include a second associated ID that identifies the second set-top box, and wherein the personal computer accesses the second requested information and transmits the second requested information and the second ID associated with the second set-top box to the second set-top box.

28. The system of Claim 27, wherein the personal computer accesses the first requested information based on a first context associated with the first set-top box and accesses the second requested information based on a second context associated with the second set-top box.

5 29. The system of Claim 27, wherein personal computer combines the first request for information and the second request for information and accesses the first requested information and the second requested information via a network.

30. The system of Claim 28, wherein the personal computer accesses the first requested information based on a first keyboard status and a first screen status.

31. The system of Claim 26, wherein the personal computer broadcasts a plurality of information packets over the communication link, wherein at least one of the information packets includes the ID that identifies the set-top box that requested the information.

32. The system of Claim 26, wherein the personal computer accesses the requested information via a network if the personal computer determines that the requested information is not stored on the personal computer.

33. A method of transferring data over a television signal transmission line comprising the step of:

transferring the data using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal  
5 over the television signal transmission line.

34. The method of Claim 33, wherein the step of transferring comprises the step of transmitting the data from a first device to a second device over the television signal transmission line which simultaneously conducts a television signal.

35. The method of Claim 33, wherein the step of transferring comprises the step of receiving the data from the television signal transmission line which simultaneously conducts a television signal.

36. The method of Claim 34, wherein the step of transmitting comprises the steps of:

generating a modulated data signal at a frequency that is based on information included in the data; and

- 5           transmitting the modulated data signal from the first device to the second device over the television signal transmission line.

37.       The method of Claim 34, wherein the step of transmitting comprises the steps of:

- converting an interface format data signal to an internal format data signal;
- generating a modulated data signal at a frequency based on information included
- 5   in the internal format data signal;
- driving the modulated data signal to compensate for a characteristic impedance of the television signal transmission line to provide a buffered modulated data signal; and
- setting a switch direction that electrically couples the buffered modulated data signal to the television signal transmission line.

38.       The method of Claim 35, wherein the step of receiving comprises the steps of:

- setting a switch direction that electrically couples the data from the television signal transmission line to provide a buffered modulated data signal;
- 5       receiving the buffered modulated data signal to compensate for a characteristic impedance of the television signal transmission line;
- generating an internal format data signal from the buffered modulated data signal using frequency shift keying demodulation based on a frequency of the buffered modulated data signal; and
- 10       converting the internal format data signal to an interface format data signal.

39.       The method of Claim 33, wherein the step of transferring comprises the step of transferring the data from a first device in a residence to a second device in the residence.

40.       The method of Claim 33, wherein the step of transferring comprises the step of transferring data over a coaxial cable.

41. A method of communicating in a residence via cable installed in the house, the method comprising the step of:

transferring data over the installed cable using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct  
5 the television signal over a television signal transmission line.

42. The method of Claim 41, wherein the step of transferring comprises the step of transmitting the data from a first device to a second device over the installed cable which simultaneously conducts a television signal.

43. The method of Claim 41, wherein the step of transferring comprises the step of receiving the data from the installed cable which simultaneously conducts a television signal.

44. The method of Claim 42, wherein the step of transmitting comprises the steps of:

converting an interface format data signal to an internal format data signal;  
generating a modulated data signal at a frequency based on information included  
5 in the internal format data signal;  
driving the modulated data signal to compensate for a characteristic impedance of the installed cable to provide a buffered modulated data signal; and  
setting a switch direction that electrically couples the buffered modulated data signal to the installed cable.

45. The method of Claim 43, wherein the step of receiving comprises the steps of:

setting a switch direction that electrically couples the data from the installed cable to provide a buffered modulated data signal;  
5 receiving the buffered modulated data signal to compensate for a characteristic impedance of the installed cable;



generating an internal format data signal from the buffered modulated data signal using frequency shift keying demodulation based on a frequency of the buffered modulated data signal; and

10        converting the internal format data signal to an interface format data signal.

46.     A cable transfer interface circuit that processes data using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to transmit the television signal over a television signal transmission line.

47.     The cable transfer interface circuit of Claim 46, wherein the frequency range is about 800KHz to 1MHz.

48.     The cable transfer interface circuit of Claim 46, wherein the television signal transmission line is a coaxial cable.

49.     The cable transfer interface circuit of Claim 46, wherein the data is transmitted from a first device in a building to a second device in the building over the television signal transmission line.

50.     A cable transfer interface circuit that transmits data from a data interface over a television signal transmission line during a transmit operation and that provides data from the television signal transmission line to the data interface during a receive operation, the data interface circuit comprising:

5        a converter that converts a first interface format data signal from the data interface to a transmit format data signal during the transmit operation;

         a transmitter, responsive to the converter, that provides a transmit modulated data signal based on the transmit format data signal using frequency shift keying during the transmit operation in a frequency range that is not within a television signal frequency  
10       range used to conduct the television signal over the television signal transmission line;

a switch, responsive to the transmitter, that electrically couples the transmit modulated data signal to the television signal transmission line during the transmit operation;

wherein the switch electrically couples data from the television signal  
15 transmission line to provide a receive modulated data signal during the receive operation;  
a receiver, responsive to the switch, that provides a receive format data signal based on the receive modulated data signal to the converter interface during the receive portion using frequency shift keying demodulation in the frequency range that is not within the television signal frequency range used to conduct the television signal over the  
20 television signal transmission line; and

wherein the converter converts the receive format data signal to a second interface format data signal during the receive operation.

51. The cable transfer interface circuit of Claim 50, wherein the transmitter comprises:

a frequency shift keying modulator that generates a modulated data signal based on information included in the first interface format data signal; and

5 a transmit interface, responsive to the frequency shift keying modulator, that transmits the transmit modulated data signal over the television signal transmission line via the switch based on the modulated data signal, wherein the television signal transmission line has an impedance in a range between about 75 ohms and 25 ohms.

52. The cable transfer interface circuit of Claim 50, wherein the receiver comprises

a receive interface that receives data from the television signal transmission line to provide a modulated data signal;

5 a frequency shift keying demodulator, responsive to the receive interface, that demodulates the modulated data signal to provide a demodulated data signal; and

a level shifter, responsive to the frequency shift keying demodulator, that shifts a voltage level of the demodulated outer signal to provide the receive format data signal.

53. The cable transfer interface circuit of Claim 50, wherein the television signal transmission line is a coaxial cable.

54. The cable transfer interface circuit of Claim 50, wherein the transmitter is located in a building; and wherein data is transmitted over the television signal transmission line to a device in the building.

55. The cable transfer interface circuit of Claim 50, wherein the frequency range is between about 800KHz and 1 MHz.

56. A system for transferring data in a residence, the system comprising:  
a cable, installed in the residence, that conducts a television signal and data transfers simultaneously;

5 a first cable transfer interface, electrically connected to the installed cable, that transfers data over the installed cable using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal over the installed cable;

10 a set-top box, electrically connected to the first cable transfer interface, that transfers data to the first cable transfer interface in response to input and distributes a video signal;

a second cable transfer interface, electrically connected to the installed cable, that transfers data over the installed cable using frequency shift keying modulation in the frequency range that is not within the television signal frequency range used to conduct the television signal over the installed cable;

15 a personal computer, electrically connected to the second cable transfer interface, that transfers data to the second cable transfer interface in response to transfers from the set-top box;

a television, responsive to the set-top box, that displays the video signal; and

20 a video cassette recorder electrically connected to the installed cable, that records the television signal and provides a recorded video signal to the television.

57. The system of Claim 56, wherein the frequency range is about 800KHz to 1MHz.

58. The system of Claim 57, wherein the cable is a coaxial cable.

59. A system for transferring data in a residence, the system comprising:  
a cable, installed in the residence, that conducts a television signal and data transfers simultaneously;

a first cable transfer interface, electrically connected to the installed cable, that  
5 transfers data over the installed cable using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal over the installed cable;

a set-top box, electrically connected to the first cable transfer interface, that  
transfers data to the first cable transfer interface in response to input and distributes a  
10 video signal;

a second cable transfer interface, electrically connected to the installed cable, that  
transfers data over the installed cable using frequency shift keying modulation in the  
frequency range that is not within the television signal frequency range used to conduct  
the television signal over the installed cable; and

15 a personal computer, electrically connected to the second cable transfer interface,  
that transfers data to the second cable transfer interface in response to transfers from the  
set-top box.

60. The system of Claim 58, wherein the frequency range is about 800KHz to 1MHz.

61. The system of Claim 58, wherein the cable is a coaxial cable.

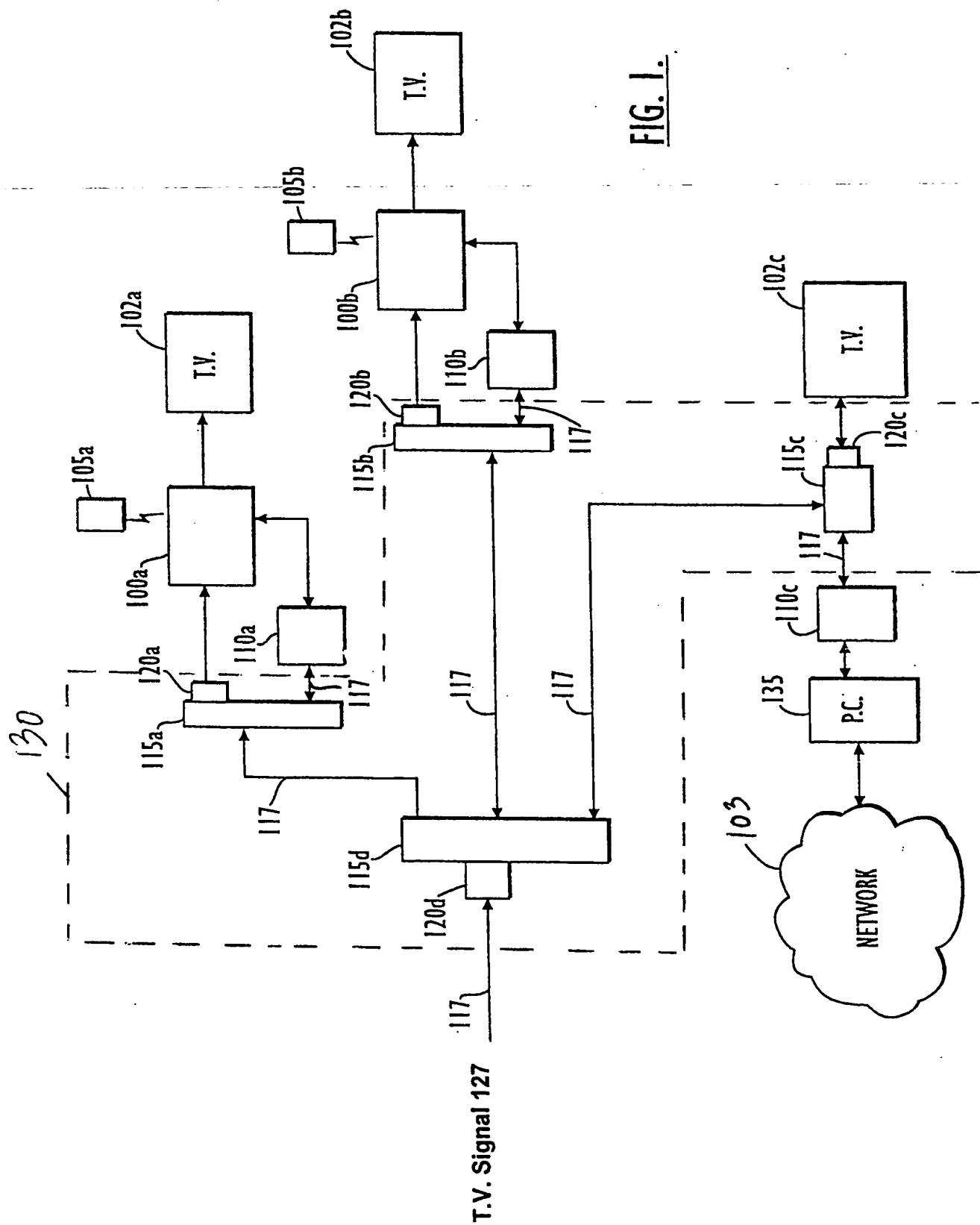
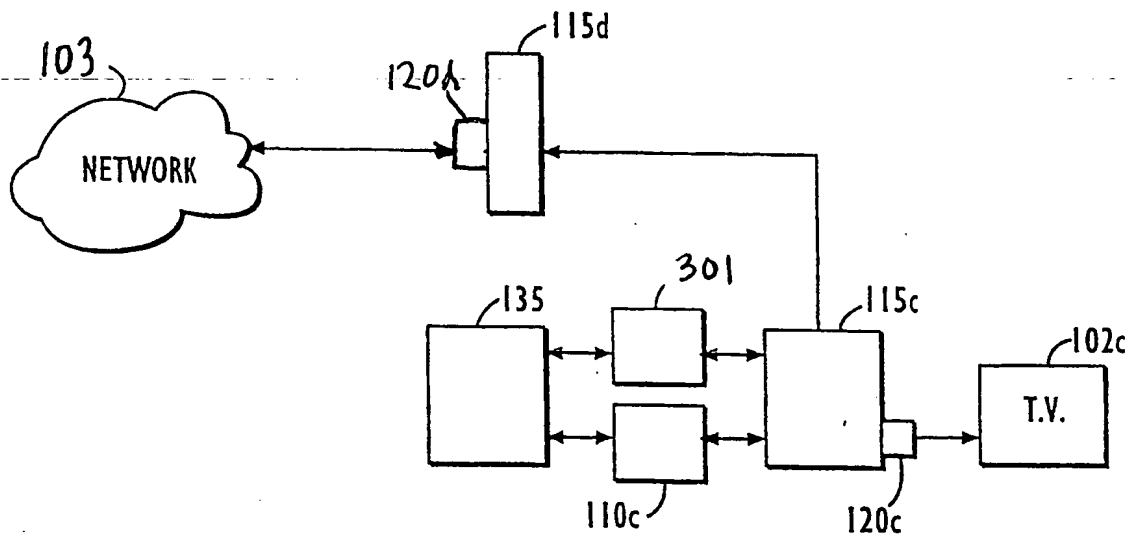


FIG. 1.

102a

THU	8:00P	8:30P	9:00P
ABC	HIGH INCIDENT		MURDER ONE
CBS	DIAGNOSIS MURDER		MALONEY
NBC	FRIENDS	SINGLE GUY	SEINFELD
FOX	<<MAJOR LEAGUE BASEBALL PLAYOFFS NLCS GAME 7>>		
SCFI	STAR TREK V: THE FINAL FRONTIER (SCI FI***)>>		
HBO	<<FRENCH KISS(COM**)		THE NET (SUS**)>>
CNN	PRIME NEWS	POLITICS	LARRY KING LIVE>>
TBS	<<WHO'S THE MAN(COM-DRA**)		NATIONAL GEOGRAPHIC
USA	MURDER SHE WROTE		CAPE FEAR>>
TWC	WEATHER SCOPE	5-DAY PLANNER	MICHELIN DRIVER'S
<div>CURRENT</div> <div>FAVORITES</div> <div>OPTIONS</div> <div>TH 10/10 8:04PM</div>			

FIG. 2.

FIG. 3.

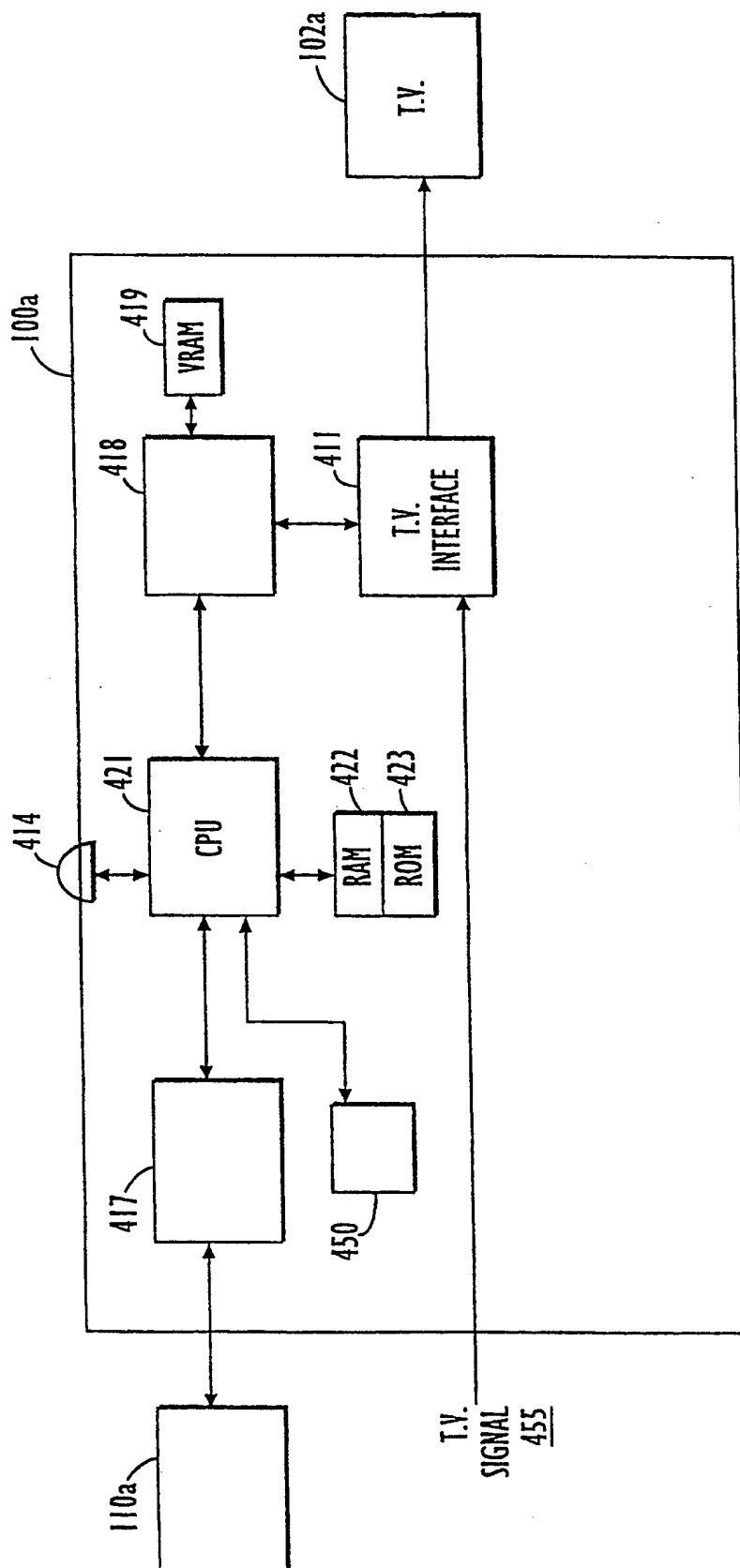


FIG. 4.



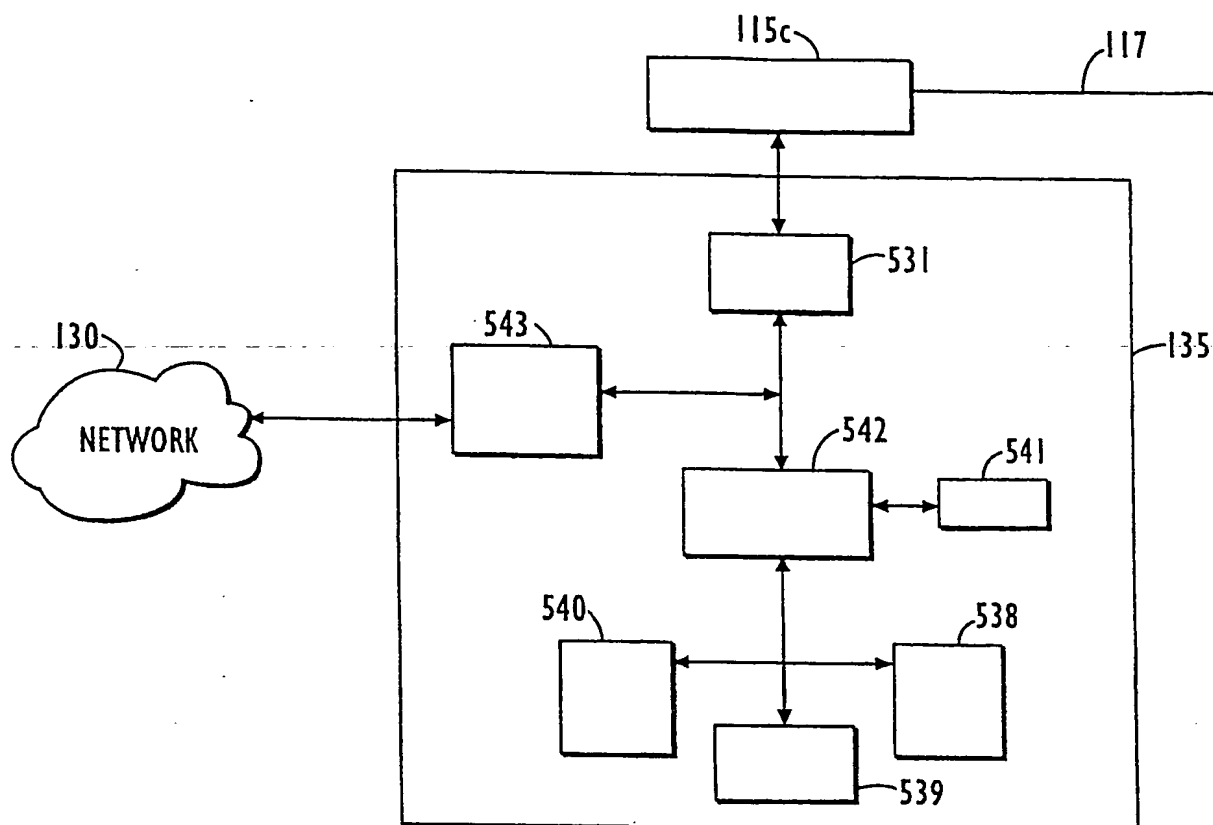
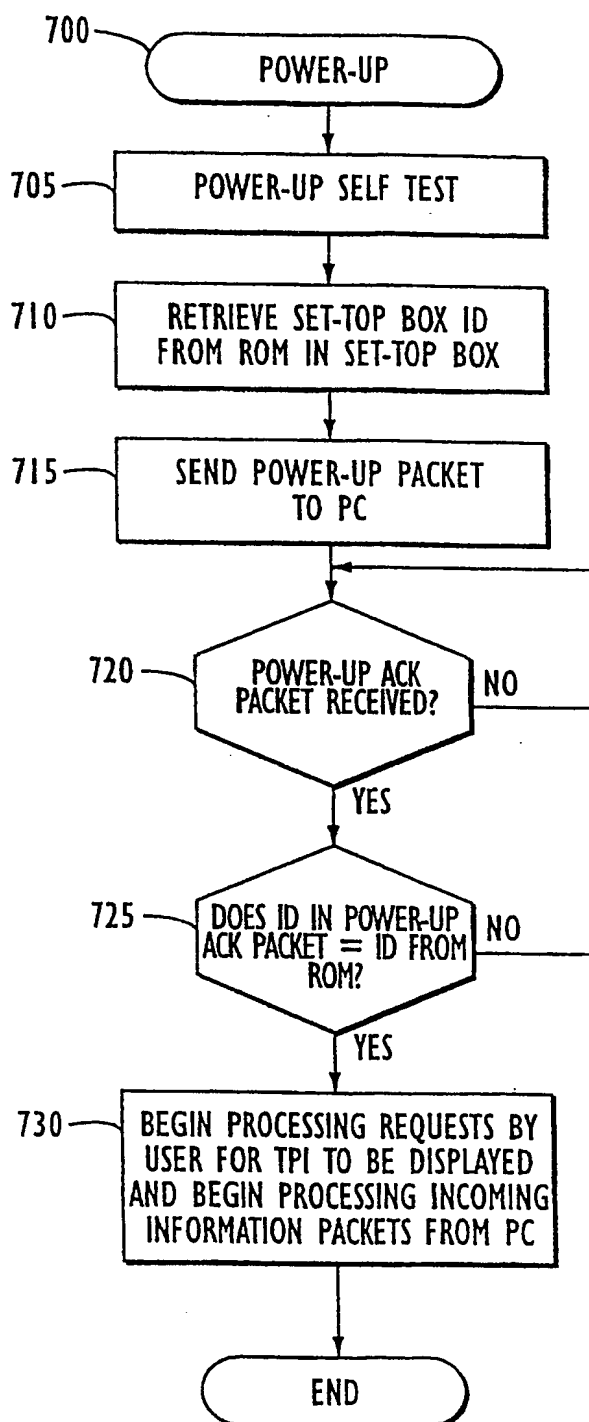


FIG. 5.

**PACKET FORMAT**

START	ID	INSTR	LENGTH	[DATA]	CKSUM	STOP
BYTE	WORD	BYTE	WORD	nBYTES	WORD	BYTE

FIG. 6.

FIG. 7.

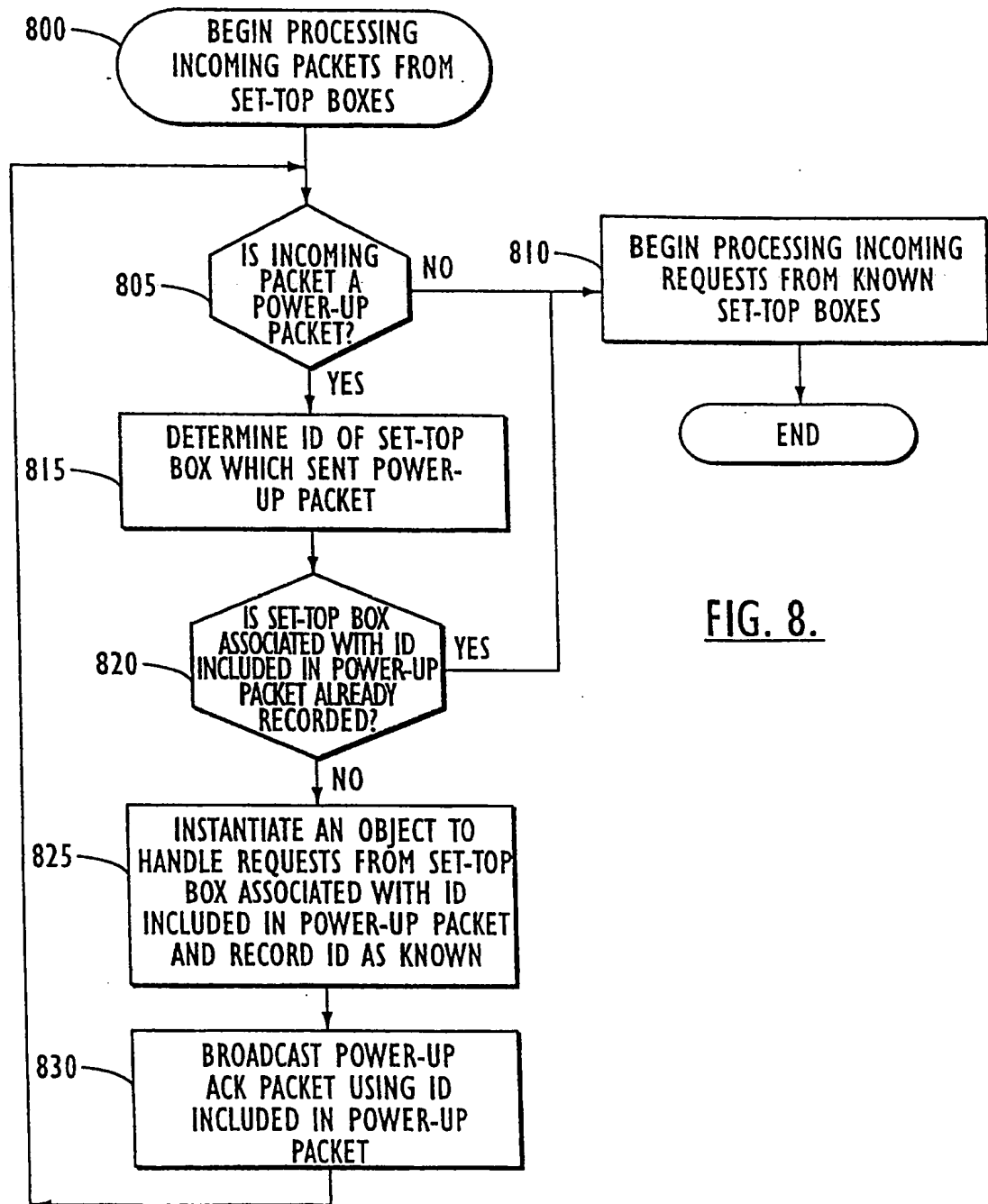
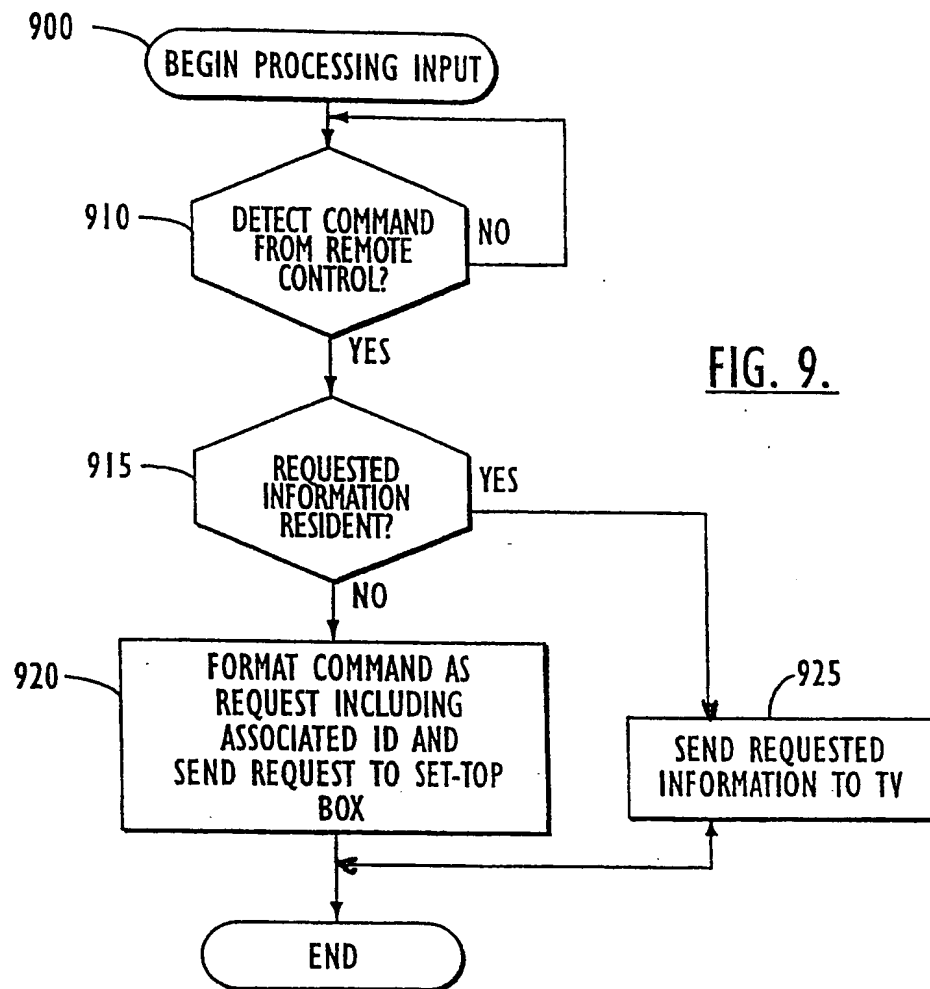
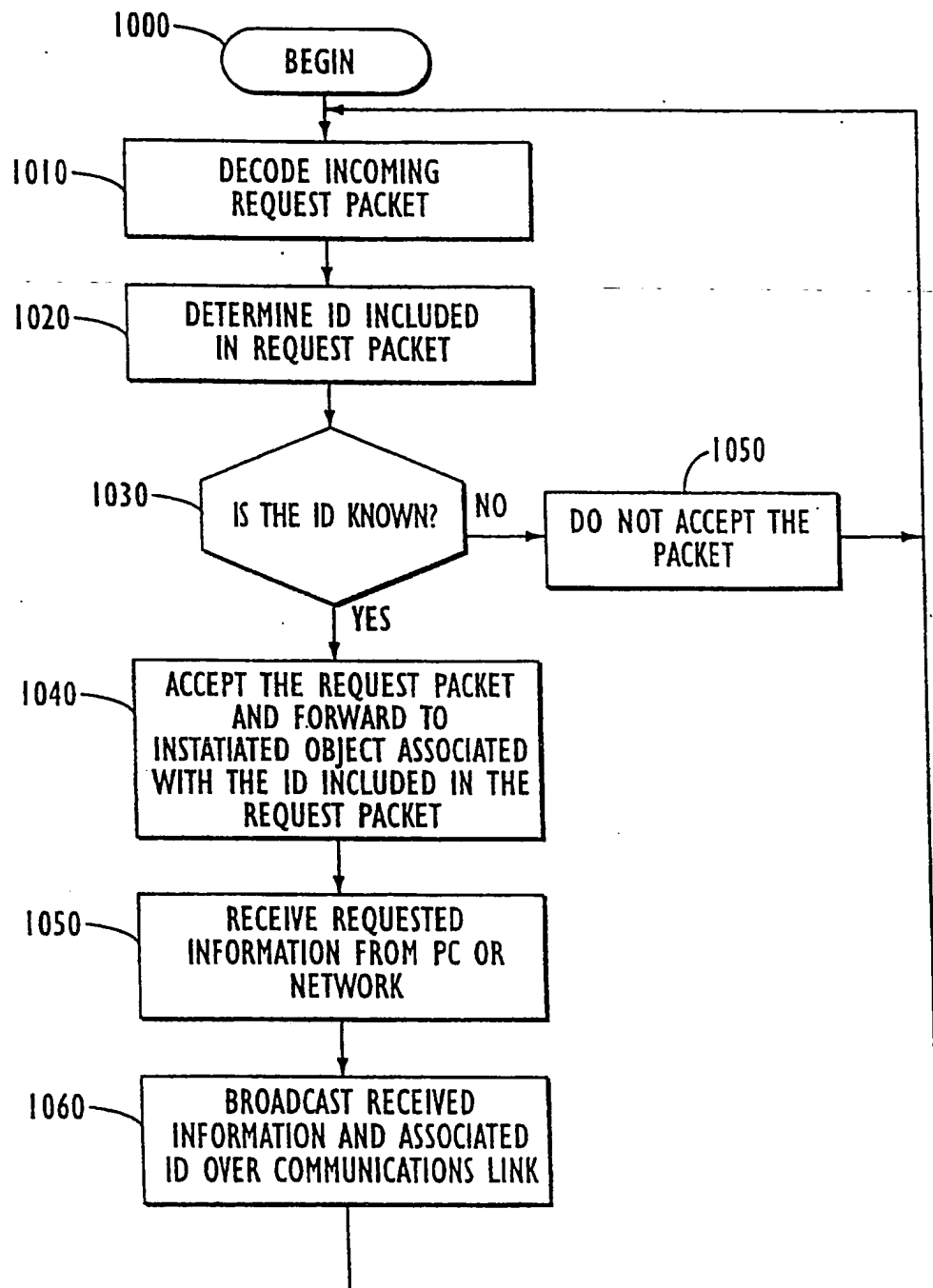


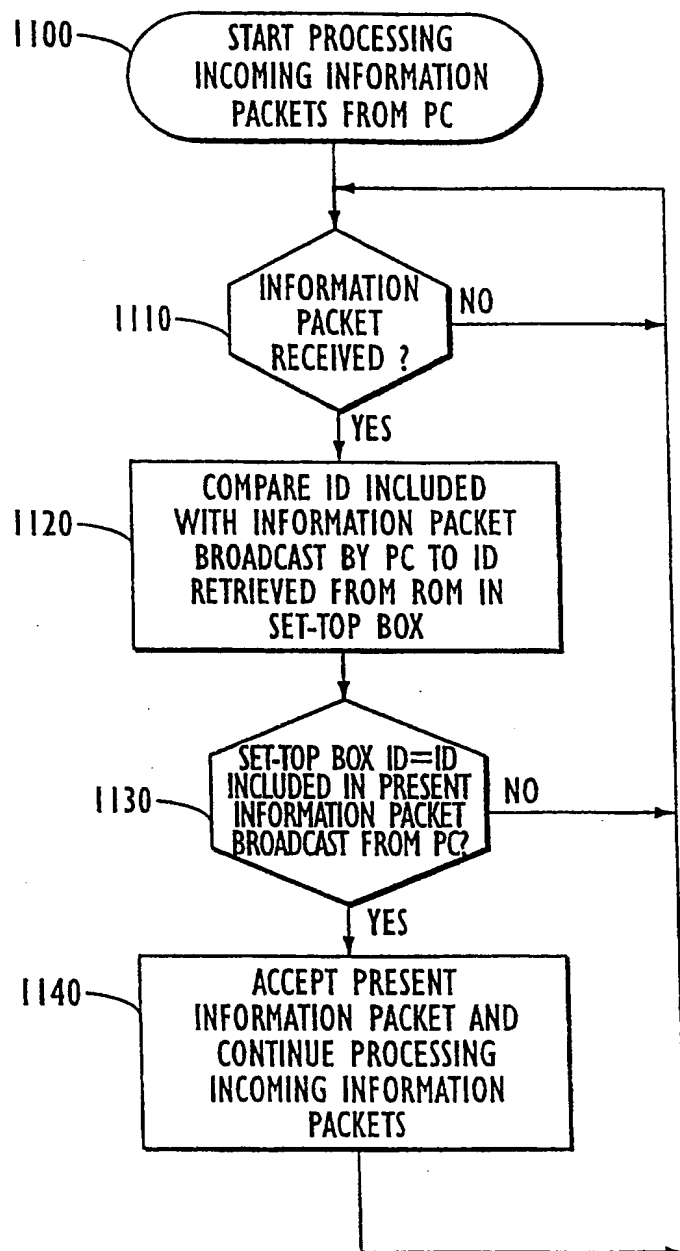
FIG. 8.

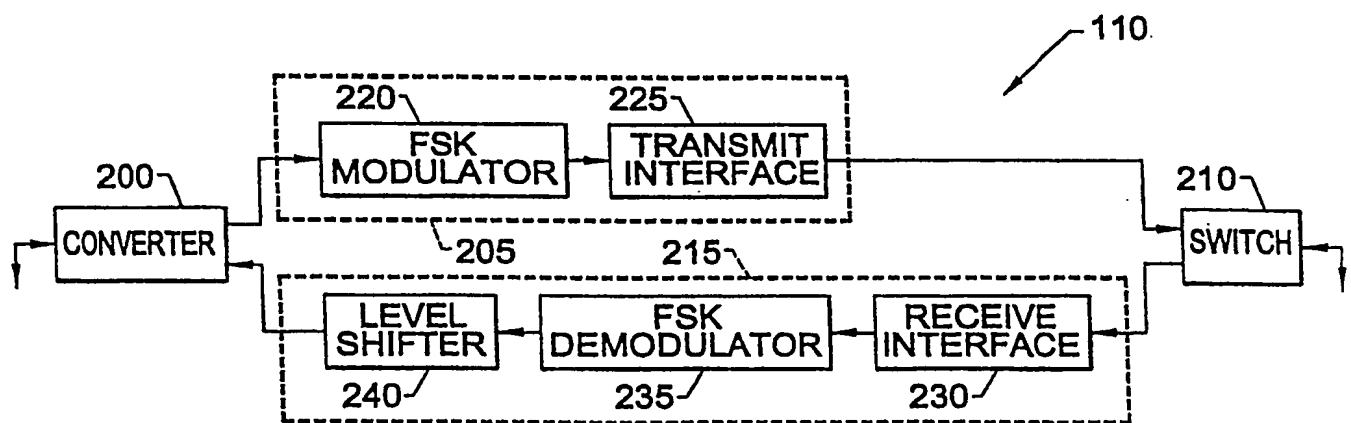
8/12



9/12

FIG. 10.

FIG. 11.

FIG.12.

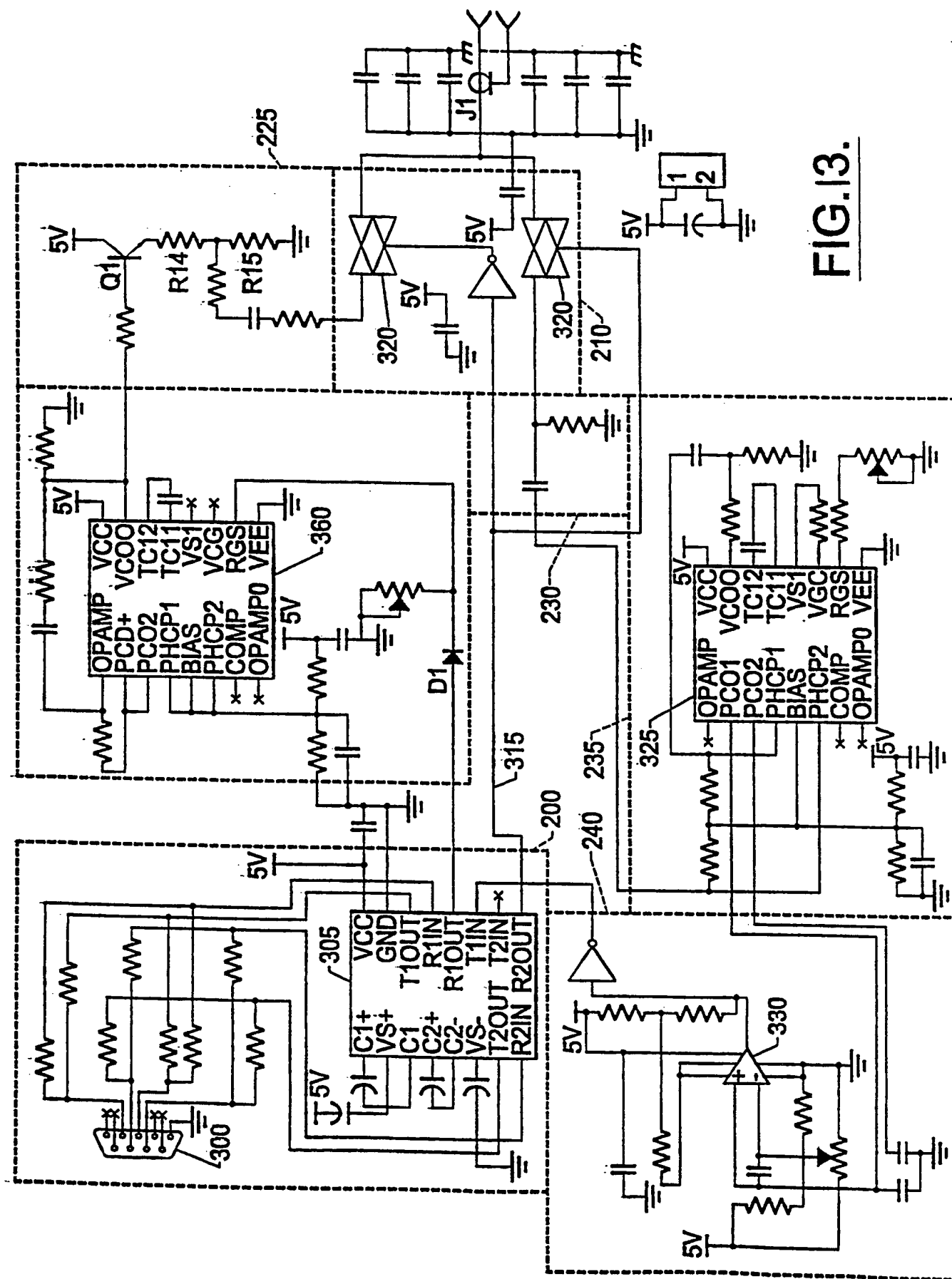


FIG.13.



# INTERNATIONAL SEARCH REPORT

Internat. Application No

PCT/US 00/02303

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04N7/24

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 5 255 086 A (MCMULLAN JR JAY C ET AL)  19 October 1993 (1993-10-19)  column 5, line 22 -column 7, line 13  column 10, line 15 -column 11, line 32  column 13, line 29 - line 47  abstract; figures 1,3  ---  -/--</p>	1-61



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

### \* Special categories of cited documents :

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- "O" document referring to an oral disclosure, use, exhibition or other means
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Date of the actual completion of the international search

5 July 2000

Date of mailing of the international search report

13/07/2000

Name and mailing address of the ISA

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Fax: (+31-70) 340-3016

Authorized officer

La, V

# INTERNATIONAL SEARCH REPORT

Internatio Application No
PCT/US 00/02303

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A	page 3, line 47 -page 5, line 5 page 11, line 56 -page 12, line 6 page 18, line 7 -page 20, line 49 abstract; figures 1,10	4, 7, 15, 17, 28, 30, 37, 38, 44, 45, 50-61
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A	abstract; claim 1; figure 5	2-10, 12, 14-20, 22-25, 27-61
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A	abstract; figure 1 column 5, line 37 - line 49 column 11, line 23 - line 29 column 12, line 21 - line 27	1-32, 37, 38, 44, 45, 50-61
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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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International application No

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Internatio      application No  
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**CORRECTED VERSION**

**(19) World Intellectual Property Organization**  
International Bureau



**(43) International Publication Date**  
**3 August 2000 (03.08.2000)**

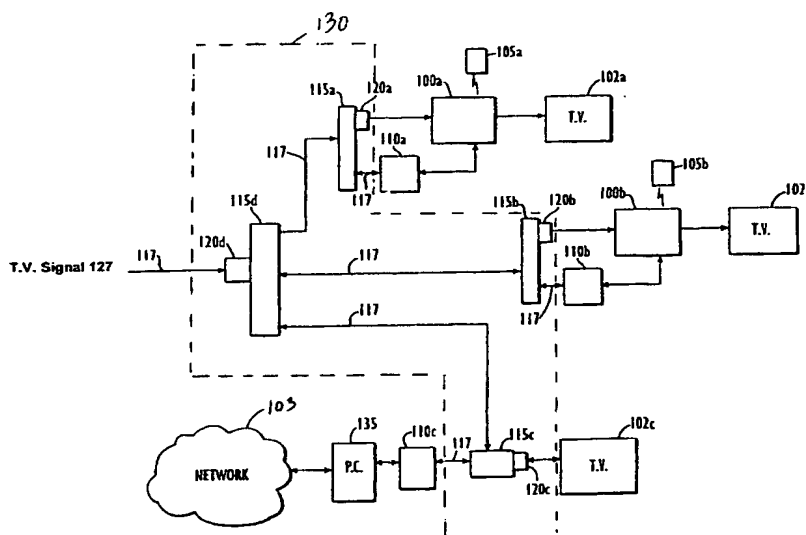
**(10) International Publication Number**  
**WO 00/45601 A1**

**PCT**

- |   |                              |  |
|---|------------------------------|--|
| (51) <b>International Patent Classification<sup>7</sup>:</b>  | H04N 7/24                    | (72) <b>Inventors:</b> CLARK, Jerry, R.; 13560 Crestmoor Drive, Farmers Branch, TX 75234-5123 (US). CUTLER, Todd, D.; 101 North Bean, Howe, TX 75459 (US). MONACO, Lawrence, D.; 2410 Bluebonnet Drive, Richardson, TX 75082-2322 (US).  |
| (21) <b>International Application Number:</b>   | PCT/US00/02303               |  |
| (22) <b>International Filing Date:</b> 28 January 2000 (28.01.2000)   |                              |  |
| (25) <b>Filing Language:</b>  | English                      | (74) <b>Agents:</b> CROUSE, Robert, N. et al.; Myers, Bigel, Sibley & Sajovec, P.A., P.O. Box 37428, Raleigh, NC 27627 (US).   |
| (26) <b>Publication Language:</b>   | English                      | (81) <b>Designated States (<i>national</i>):</b> AE, AL, AM, AT, AT (utility model), AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, CZ (utility model), DE, DE (utility model), DK, DK (utility model), EE, EE (utility model), ES, FI, FI (utility model), GB, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (utility model), SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW. |
| (30) <b>Priority Data:</b>  |                              |  |
| 09/239,215  | 29 January 1999 (29.01.1999) | US   |
| 09/370,561  | 9 August 1999 (09.08.1999)   | US   |
| (71) <b>Applicant:</b> BROWN, Douglas, G. [US/US]; 108 Wyndham Cove, Cherryville, NC 28021 (US).                          |                              |  |
| (71) <b>Applicant and</b>   |                              |  |
| (72) <b>Inventor:</b> SCHULTHEISS, Christopher, J. [US/US]; 419 Quay Assisi Street, New Smyrna Beach, FL 32169-3604 (US). |                              | (84) <b>Designated States (<i>regional</i>):</b> ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU)   |

*[Continued on next page]*

**(54) Title: METHODS AND SYSTEMS FOR PROVIDING INFORMATION TO SET-TOP BOXES HAVING SET-TOP BOX IDENTIFIERS USING FREQUENCY SHIFT KEYING MODULATION**



**(S7) Abstract:** A set-top box is provided wherein an Identifier (ID) associated with the set-top box can be used to request information from a personal computer which provides the requested information to the set-top box. In particular, in a system that includes multiple set-top boxes, the ID can be used to determine which set-top box made a request and to determine which set-top box is the intended recipient of the requested information accessed by the system. The information can be provided over a cable which is used to connect a television signal. In particular, the information can be transferred using frequency shift keying modulation.

**WO 00/45601 A1**



MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

**(15) Information about Correction:**

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**Published:**

— *with international search report*

**(48) Date of publication of this corrected version:**

20 September 2001

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*



**METHODS AND SYSTEMS FOR PROVIDING INFORMATION  
TO SET-TOP BOXES HAVING SET-TOP BOX IDENTIFIERS  
USING FREQUENCY SHIFT KEYING MODULATION**

**Field of the Invention**

The present invention relates to the field of communications in general, and more particularly, to data transmission.

**Background of the Invention**

5           The television (TV) has become ubiquitous in modern society. As a result, a variety of services are being provided via TV. Many of the services are provided using a set-top box that works in conjunction with the TV to provide the desired service. One example of a service provided via a TV is an online TV program guide, wherein TV program schedule information is displayed on a TV for searching and selection by a viewer. Online TV program guides are described in U.S. Patent 4,751,578 to Reiter et. al. entitled *System for Electronically Controllable Viewing on a Television Updateable Television Programming Information*. Other popular services are also provided using a set-top box. For example cable or satellite TV may be provided using a tuner packaged as a set-top box. The tuner decodes the transmission from the service provider and  
10           formats the signal for display on the TV. Moreover, many households have more than one TV.  
15

          It is also known to provide some services over the Internet using set-top boxes. One such service is WebTV which enables a user to browse the Web using a TV as the display. WebTV, however, duplicates much of the hardware and software included in a standard PC. For example, WebTV includes a modem while many PCs come equipped with one. Consequently, the consumer who already owns a PC may pay the cost of the modem twice: once when buying the PC and a second time when buying WebTV.  
20           Furthermore, WebTV may also duplicate a portion of the functions found in most TVs.

This duplication of PC and TV components may make WebTV unnecessarily expensive or complex to the many consumers who already own a PC.

As the popularity of TV and services increase, it may become more desirable to provide multiple users in the same household with the capability to use services separately. Unfortunately, the cost to provide multiple TV users separate access to the services described above may be prohibitive. For example, viewers of different TVs may desire separate information.

Furthermore, as the popularity of cable television services increases, new consumer devices may become available for home use. For example, new types of consumer devices such as cable ready televisions, cable tuners, and video cassette recorders may be connected to cabling which carries the transmission of the cable television services for use by consumers in their homes. As the number of consumer devices used in the home increases, the cabling needed inside the home may also increase and become unwieldy. As a result, the cabling may be integrated into the structure of the home, for example in the walls and floors. It is known to use coaxial cable having an impedance of 75 ohms in some cable systems for the transmission of the cable television services.

The cabling may conduct television signals and other signals which include the cable television services, and Direct Current (DC) voltages or Alternating Current (AC) voltages for controlling the consumer devices. For example, a television signal and a DC voltage may be transmitted over the cabling to provide a video signal and a DC voltage for controlling a cable tuner.

Personal Computers also may be capable of communicating with other devices, such as the consumer devices described above. Unfortunately, separate wiring may be needed to provide the communications between the devices. For example, a serial data cable may be needed to connect two PCs. Unfortunately, if the PCs are located in different areas of the home, the serial data cable may need to be long which may make the serial data cable expensive and unwieldy. Therefore, a need exists to further improve methods and systems for providing services via consumer devices and PCs.

30

### Summary of the Invention

It is an object of the present invention to provide improved set-top boxes for use with television services.

5 It is another object of the present invention to provide improved systems for the use of multiple set-top boxes.

It is, therefore, an object of the present invention to allow an improvement in the transfer of data between devices within a building.

It is another object of the present invention to allow improvement in transferring data over transmission lines which conduct television signals.

10 These and other objects of the present invention may be provided by set-top boxes, identified by respective identifiers (IDs), that send requests for information to a PC over a television signal transmission line. The request can include the ID of the set-top box that made the request. When the requested information is accessed, the requested information and the ID of the set-top box that made the request can be transmitted over  
15 the communications link to the set-top box using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal on the television signal transmission line. Accordingly, multiple set-top boxes may access information from a single residence via an existing PC, thereby allowing a more cost-effective approach than conventional systems.

20 In one embodiment, a computer program running on the PC can handle requests from the plurality of set-top boxes. In another embodiment, a computer program can be instantiated for each of the plurality of set-top boxes. For example, a first computer program can be instantiated to handle requests from the first set-top box and a second computer program can be instantiated to handle requests from the second set-top box.

25 The frequency shift keying modulation can be provided by generating a modulated data signal based on information included in the data. For example, the frequency shift keying modulation can generate a modulated data signal at a first frequency when the data is equal to a logical 0 and at a second frequency when the data is equal to a logical 1. In one embodiment, the first frequency is about 800KHz and the  
30 second frequency is about 1MHz.

Frequency shift keying modulation may provide a reduction in the cost of transferring data. In particular, the frequency shift keying modulation may be embodied using relatively few components. In contrast, some conventional data transfers are performed using phase shift keying modulation which may be more expensive than a system according to the present invention.

### **Brief Description of the Drawings**

**FIG. 1** is a block diagram of a first embodiment of systems and methods according to the present invention.

10 **FIG. 2** is an exemplary display of information provided to a user on a TV.

**FIG. 3** is a block diagram of a second embodiment of systems and methods according to the present invention.

**FIG. 4** is a block diagram of an embodiment of a set-top box according to the present invention.

15 **FIG. 5** is a block diagram of an embodiment of a PC according to the present invention.

**FIG. 6** is an embodiment of a packet structure according to the present invention.

**FIG. 7** is a flowchart that illustrates initialization operations of a set-top box according to the present invention.

20 **FIG. 8** is a flowchart that illustrates initialization operations of a computer program running on the PC in coordination with the operations illustrated in **FIG. 7**.

**FIG. 9** is a flowchart that illustrates operations of a set-top box in response to requests for information.

25 **FIG. 10** is a flowchart that illustrates operations of the computer program running on the PC in response to incoming requests for information from set-top boxes.

**FIG. 11** is a flowchart that illustrates operations of a set-top box in response to information broadcast by the PC.

**FIG. 12** is a block diagram of a cable transfer interface according to the present invention.

30 **FIG. 13** is a schematic diagram of an exemplary embodiment of a cable transfer interface according to the present invention.

### **Detailed Description of the Invention**

The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which a preferred embodiment of the invention is shown. This invention may, however, be embodied in many different forms and should  
5 not be construed as limited to the embodiments set forth herein; rather these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

The phrase "television signal" as used herein includes signals formatted for display on television sets such as National Television System Committee (NTSC) format  
10 video provided in some conventional cable television systems. NTSC formatted video includes 525 lines at a horizontal frequency of 15.734 KHz and a vertical frequency of 60 Hz. Other signals formatted for display on television also are included. As described herein the phrase "transmit operation" refers to the transmission of data from a PC to a set-top box over a transmission line. Similarly, the phrase "receive operation" refers to the  
15 transmission of data from the set-top box to the PC. Like numbers refer to like elements throughout.

As will be appreciated by one of skill in the art, the present invention may be embodied as a method, data processing system and/or program product. Accordingly, the present invention may take the form of an entirely hardware embodiment, an entirely  
20 software embodiment or an embodiment combining software and hardware aspects. Furthermore, the present invention may take the form of a computer program product on a computer-readable storage medium having computer-readable program code means embodied in the medium. Any suitable computer readable medium may be utilized including hard disks, CD-ROMs, optical storage devices, or magnetic storage devices.

25 The present invention is also described using block diagrams and flowcharts. Those skilled in the art will understand that the blocks in the block diagrams and the flowchart illustrations, and combinations of blocks, may be implemented with various commonly used components. It will also be understood that portions of the operations described in the blocks may be executed as computer program instructions loaded into a  
30 computer or other data processing apparatus, thus producing a machine which provides means for implementing the functions specified in the flowchart blocks and combinations

thereof. The computer program may cause operational steps to be performed on the computer or data processing apparatus to produce a computer-implemented process such that the instructions which execute on the computer or data processing apparatus provide steps for implementing the functions of the blocks or combinations thereof. Accordingly, 5 the blocks support combinations of means for performing the specified functions and combinations of steps for performing the specified functions.

**FIG. 1** is a block diagram that illustrates systems and methods according to a first embodiment of the present invention. According to the embodiment of **FIG. 1**, the system can include a plurality of set-top boxes **100a-b**, each of which accepts requests 10 from respective remote controls **105a-b**. According to **FIG. 1**, a user pushes buttons on the remote control **105a** to request the display of information on a TV **102a**. The remote control **105a** transmits a corresponding command to the set-top box **100a** associated with the remote control. It will be understood that functions of the remote control alternately can be provided directly on the set-top box and/or the remote control can be coupled to 15 the set-top box via means such as a cable, RF coupling and/or IR coupling. The set-top box **100a** can send a request for the information to a Personal Computer (PC) **135** over a communications link **130**. Each set-top box **100a-b** can request different information from the PC **135**, which responds by accessing the requested information locally or via a network **103**, such as the Internet. As used herein, the term "information" includes 20 information such as television program information (such as that shown in **FIG. 2**), e-mail, chat, sports scores, weather and the like. Set-top boxes are discussed in U.S. Patent Application No. 09/005269 entitled *Methods and Systems for Providing Television Related Services via a Networked Personal Computer* which is commonly assigned to the assignee of the present application and which is incorporated herein by reference.

25 Each request for information by a set-top box **100a-b** can include an Identifier (ID) that identifies the set-top box **100a-b** which made the request. For example, the first set-top box **100a** can be identified by a first ID of  $FF_{16}$  and the second set-top box **100b** can be identified by a second ID of  $F0_{16}$ . Requests sent to the PC **135** by the first set-top box **100a** include the first ID  $FF_{16}$  and requests sent to the PC **135** by the second set-top 30 box **100b** include the second ID  $F0_{16}$ . The PC **135** can use the respective IDs of the first

and second set-top boxes **100a-b** to associate each received request with the set-top box that sent the request.

The PC **135** can access the requested information and can broadcast the requested information and the ID of the set-top box **100a-b** that made the request over the  
5 communications link **130**. For example, the PC **135** can broadcast information requested by the first set-top box **100a** with the first ID  $FF_{16}$  and can broadcast information requested by the second set-top box **100b** with the second ID  $F0_{16}$  over the communications link **130**.

Each set-top box **100a-b** can receive the information and the associated ID  
10 broadcast by the PC **135**. Each set-top box **100a-b** can compare the ID included with the information broadcast by the PC **135** to the ID stored in the set-top box **100a-b**. For example, when the PC **135** broadcasts the information requested by the first set-top box **100a**, the PC **135** includes the first ID. Accordingly, the first set-top box **100a** compares the ID associated with the first information broadcast by the PC **135** to the ID associated  
15 with the first set-top box **100a**. When a match occurs, the first set-top box **100a** accepts the information and provides it to the TV **102a**. Moreover, the second set-top box **100b** compares the ID associated with the first information broadcast by the PC **135** to the ID associated with the second set-top box **100b**. When a mismatch occurs, the second set-top box **100b** does not accept the information.

20 The communications link **130** can be any communications medium known to those having skill in the art. In one embodiment, the communications link **130** can be a cable **117** such as those used to provide cable service to residential customers. Each set-top box **100a-b** and the PC **135** can be electrically coupled to the cable **117** via respective Cable Transfer Interfaces (CTI) **110a-c**. In particular, each set-top box **100a-b** can send  
25 requests for information over the cable **117** through the associated CTI **110a-b**. The PC **135** can receive the requests and can broadcast requested information through the associated CTI **110c**. The cable **117** couples the CTIs **110a-c** to one another through cable splitters **115 a-d**. The cable splitters **115a-d** can be used to distribute an input signal to multiple outputs while maintaining the proper termination for the cable **117**.  
30 Direct Current (DC) blocking circuits **120a-e** can be used to filter DC voltage levels

provided by some cable systems and fed back by some TVs and set-top boxes on the cable 117.

The set-top box 100a can request information by sending requests to the PC 135 and can receive the corresponding information from the PC 135 over the communications  
5 link 130 according to a command protocol described herein. User commands received from the remote control 105a are processed by the set-top box 100a to determine what action is necessary to display the desired information. If the requested information is not available within set-top box 100a, the set-top box 100a can send a request for the information to the PC 135. In response, the information requested by the set-top box  
10 100a can be broadcast over the communications link 130 by the PC 135 and can be received by the appropriate set-top box 100a which formats the information for display on the TV 102a.

A request can include computer commands organized to access the information requested by the user via the remote control 105a. For example, the request may  
15 comprise a list of instructions which cause the PC 135 to access the network 130 and issue some of the commands included in the request to the network 130. In one embodiment, the access to the network can be provided using a telephone line. In the alternate embodiment of FIG. 3, access to the network can be provided by the cable system via a cable modem 301.

20 As shown in FIG. 4, the set-top box 100a can include a central processing unit (CPU) or controller 421, a Random Access Memory (RAM) 422, a Read Only Memory (ROM) 423, a Video Processing system (VP) 418, a Video Buffer (VRAM) 419, a TV interface 411, a Communication Link Interface (CLI) 417, and a wireless infra-red (IR) sensor 414. In one embodiment, the ID of the set-top box 100a can be stored in the ROM  
25 423. In another embodiment, the ID can be encoded by switches 450, the settings of which can be read by the CPU 421. The above components are well known to those having skill in the art and need not be described further herein.

The CPU 421 may be suitable for running a computer program to process information from the PC 135, processes user commands from the remote control 105a,  
30 control the formatting of information for display on the TV 102a, and provide general system services to the set-top box 100a. The CPU 421 may process user commands



received from the remote control 105a as a stream of serial data. For example, if the user pushes a button on the remote control 105a that corresponds to a command requiring information from the network 103, the CPU 421 receives the command in an internal serial buffer from the IR sensor 415. The CPU 421 sends a corresponding computer  
5 command to the CLI 417 and the command is transmitted over communications link to the PC 135 via the CTI 110a and the network 103. The CPU 421 may also process information from the PC 135. For example, when information is returned from the network 130, it is received by the CLI 417. The CPU 421 accepts the information from the CLI 417 as a stream of serial data. In one embodiment, the CPU 421 may process the  
10 data received from the remote control 105a and information from the PC 135 and the network 103 as a single serial data stream.

The VP 418 may be used by the CPU 421 to combine information from the PC 135 with a TV signal 455 for display on the TV 102a or select between the two for display. The data from the VP 418 may be represented in RGB format wherein a first  
15 portion of the data represents red information, a second portion represents green information, and a third portion represents blue information. The VP 418 may be implemented with a YVG606 Video Processor manufactured by Yamaha Inc.

The wireless IR sensor 414 receives user commands from the remote control 105a. The wireless IR sensor 414 provides the user commands from the remote control  
20 105a to the CPU 421 for processing. The user commands can be processed by the CPU 421 as a serial data stream.

The PC 135 examines the request from the set-top box 100a to determine which set-top box 100a-b is requesting the information. In one embodiment, a computer program running on the PC 135 handles the requests from the set-top boxes 100a-b in an  
25 integrated fashion. For example, the computer program can record each request and the ID of the set-top box 100a-b which made the request in a table or using other techniques known to those having skill in the art. The computer program may cause the PC 135 to access the requested information and broadcast the requested information and the ID associated with the request over the cable 117. For example, if the computer program  
30 determines that the requested information should be accessed via the Internet, the computer program causes the PC 135 to access and request the information from the

Internet. When the requested information is provided to the computer program from the Internet, the computer program looks up the request in the table to determine which set-top box **100a-b** requested the information and broadcasts the requested information and the associated ID on the cable **117**.

5           Requests from the set-top box **100a-b** are handled in view of the context in which the requests are made. For example, if the first set-top box **100a** is presently displaying an e-mail session, subsequent requests are handled in the context of an e-mail session. In particular, the screen being currently displayed by the set-top box **100a** and the keyboard input can be included in the context of the requests.

10           The computer program can combine requests from multiple set-top boxes **100a-b** to the network. For example, if a first set-top box **100a** sends a first request for first information and a second set-top box **100b** sends a second request for second information, the computer program combines the two requests into a single request to the network **130** using techniques known to those having skill in the art.

15           In another embodiment of the present invention, the PC **135** instantiates a plurality of computer programs, wherein each of the plurality of computer programs instantiated is associated with one of the set-top boxes **100a**. In this embodiment, an interface program running on the PC **130** interfaces the plurality of computer programs to the network **130**. For example, in a situation where the first and second set-top boxes  
20   **100a-b** are being used, respective first and second computer programs are instantiated to handle requests from the set-top boxes **100a-b**. Accordingly, when the first and second set-top boxes **100a-b** request information from the network **130**, the interface program coordinates access to the network **103**.

          According to **FIG. 5**, the PC **135** can be a computer capable of running a wide  
25   range of applications software and may include a CPU **542**, a memory **541**, a network interface **543**, a hard disk drive **540**, an interface **531**, a keyboard **539**, a monitor **538** and other hardware and software components commonly found in personal computers. For example, the PC **135** may be implemented using a Pentium microprocessor marketed by Intel running the Windows 98 Operating System marketed by Microsoft Inc. The PC **135**  
30   processes the requests for information received from the set-top boxes **100a-b** over the cable **117** via the CTI **110c**, and accesses the requested information which is broadcast

over the cable 117 through the CTI 110c. In addition, other processing systems such as workstations, mainframes, mini computers, and/or custom systems can be used.

Requests by the set-top boxes 100a-b and information broadcast by the PC 135 can be structured in a packet format as illustrated in FIG. 6. Accordingly, requests for the set-top boxes 100a-b can be referred to as request packets, and requested information broadcast by the PC 135 can be referred to as information packets. The packet format of FIG. 6 can include a START byte, an ID word, an INSTR byte, a LENGTH word, a number of DATA bytes, a CKSUM word, and a STOP byte. The Start byte can signal the start of the packet. In a particular embodiment, the START byte can be the value FF<sub>16</sub>. The ID word corresponds to the ID associated with the set-to box 100a-b. In one embodiment, the ID word can be the least significant word of the serial number of the set-top box.

The INSTR byte can be an instruction or command to be executed by the set-top box 100a. The LENGTH word can be the number of bytes contained in the DATA field. The DATA can be a number of data bytes associated with the INSTR field. For example, if a particular command or instruction has associated data or parameters, the data is stored in the DATA field. The number of data bytes included in the DATA field is described by the LENGTH field. The CKSUM can be the least significant word of the sum of each byte contained in the INSTR, LENGTH, and DATA fields. The STOP byte can signal the end of the packet. In a particular embodiment, the STOP byte is the value FF<sub>16</sub>.

FIG. 7 is a flowchart that illustrates initialization operations of the set-top box according to the present invention. When the user powers the set-top box up (block 700) a self test can be performed (block 705). The ID of the set-top box can be determined and a power-up packet can be sent to the PC (block 715). The power-up packet can signal the PC that the set-top box has been turned on and may provide requests for information. The set-top box can wait for an acknowledgement packet from the PC (block 720). The acknowledgement packet can signal the set-top box that the power-up packet was recognized by the PC.

When the acknowledgement packet is received from the PC (block 725), the set-top box begins processing requests from the user for information to be displayed and begins processing information packets broadcast by the PC (block 730).

**FIG. 8** is a flowchart that illustrates initialization operations of a computer program running on the PC 135 in coordination with the initialization operations illustrated in **FIG. 7**. The computer program begins processing incoming requests from the set-top boxes in block 800. A determination is made as to whether an incoming packet is a power-up packet from a set-top box (block 805). If the incoming packet is not a power-up packet, the packet is processed as a request packet from a known set-top box as shown in **FIG. 9** (block 810).

If the packet is a power-up packet, the ID associated with the power-up packet is determined (block 815) and the ID is compared to the IDs of all known set-top boxes (block 820). If the ID included in the power-up packet is the same as an ID associated with a known set-top box, operations continue with the processing of incoming request packet (block 810). If the ID included in the power-up packet is not known, the ID is recorded as an ID associated with a known set-top box and a computer program according to the present invention is instantiated (block 825). In particular, request packet from the set-top box associated with the ID included in the power-up packet above are handled by the instantiated computer program. Accordingly, a computer program may be instantiated for each known set-top box. A power-up acknowledgement packet is broadcast on the communications link (block 830) and the operations continue, wherein a determination is made as to whether an incoming packet is a power-up packet from a set-top box (block 805).

**FIG. 9** is a flowchart that illustrates operations of a set-top box in response to requests for information. According to **FIG. 9**, the set-top box begins processing input at block 900. The set-top box waits for a command from the remote control (block 910). When a remote control command is detected (block 910), the set-top box determines if the requested information is resident in the set-top box (block 915). If the information is resident in the set-top box, the set-top box sends the requested information to the TV (block 925). If, however, the requested information is not resident in the set-top box, the

set-top box sends a request for the information, including the ID of the set-top box, to the PC (block 920).

**FIG. 10** is a flowchart that illustrates operations of a computer program running on the PC in response to incoming request packets for information from the set-top boxes. According to **FIG. 10**, processing begins at block 1000. An incoming request for information is decoded (block 1010) and the ID included in the request is determined (block 1020). If the ID included in the request is not associated with a known set-top box (block 1030), the request is not accepted and processing continues at block 1010.

If, however, the ID included in the request is associated with a known set-top box (block 1030), the request is accepted and provided to the computer program instantiated to handle requests from the set-top box associated with the ID included with the request (block 1040). When the requested information is received (block 1050), the requested information is broadcast over the communications link (block 1060) and processing continues at block 1010.

**FIG. 11** is a flowchart that illustrates operations of a set-top box in response to information broadcast by the PC. According to **FIG. 11**, the processing of incoming packets from the PC begins in block 1100. When a packet is received from the PC (block 1110), the ID included in the packet is compared to the ID of the set-top box (block 1120).

If the ID included in the packet is not equal to the ID of the set-top box (block 1130), the packet is not accepted by the set-top box. The set-top box waits for another incoming packet from the PC (block 1110). If the ID included in the packet is equal to the ID of the set-top box (block 1130), the packet is accepted and the requested information is provided to the TV (block 1140) and processing continues at block 1010.

An embodiment of the cable transfer interface 110a will now be described in greater detail. According to **FIG. 1**, data is transferred between the PC 135 and the set-top box 100a over the transmission line 130, such as a coaxial cable, used to conduct a television signal. The set-top box 100a controls the display of a television 102 in response to commands issued by a user to the set-top box 100a. Some commands may cause the set-top box 100a to request information, such as broadcast times, from the PC

135. In response, the PC 135 may retrieve the information from the network 103 and transmit the information to the set-top box 100a.

Although the embodiment of FIG. 1 shows the PC 135 connected to the set-top box 100 via the transmission line 130, it will be understood that other devices may be used. For example, in another embodiment, two PCs may be connected via the  
5 transmission line 130 to allow the transfer of serial data between the PCs. In still another embodiment, the cable transfer interface can be powered by a separate DC power supply.

Data is transferred between the PC 135 and the set-top box 100a in a half-duplex fashion that may be controlled by a computer program running on one or more  
10 processors. For example, the PC 135 and the set-top box 100a may each include one or more processors that run computer programs to coordinate the transfer of data over the transmission line 130. In operation, a transmission by either the PC 135 or the set-top box 100a may stop to allow the other device to transmit. The half-duplex control of the PC 135 and the set-top box 100a can be performed according to techniques known to  
15 those having skill in the art. The transmission line 130 includes the splitters 115 a-d that distribute the television signal 127 to the plurality of devices via cables 117 as shown in FIG. 1. The transmission line 130 can include conventional cabling such as that installed in the walls and floors of houses.

For simplicity, the transmit operation is described first, wherein data is  
20 transmitted from the set-top box 100a to the PC 135 such as when the user requests programming information to be displayed. Second, a receive operation is described in which data is transmitted from the PC 135 to the set-top box 100a such as when the PC 135 responds to the request by transferring the program information to the set-top box 100a.

25 In the transmit operation, the set-top box 100 can transmit data to the first cable transfer interface (CTI) 110a using an interface format such as an RS-232 serial interface standard, although other interface formats may be used as well. In one embodiment, a 9-pin serial data port on the set-top box 100 can be used to transmit and receive the data.

The first cable transfer interface 110a can process the data received from the set-  
30 top box 100 using frequency shift keying modulation to provide a modulated data signal which is transmitted over the transmission line 130 which also conducts the television

signal 127. However, the modulated data signal occupies a frequency range that is not within the television signal frequency range used to conduct the television signal.

The data transmitted by the first cable transfer interface 110a is transferred to the PC 135 through splitters 115a, c, d. The splitter 115d distributes the television signal 127 to the televisions 102a-c, the first and second cable transfer interfaces 110a, c and the set-top boxes 100a-b via the cable 117. Consequently, the cable 117 conducts a distributed version of the television signal 127 and the data transmitted by the first cable transfer interface 110a. Other devices, such as videocassette recorders or other devices known in the art may be used in place of the televisions 102.

A second cable transfer interface 110c can process the data transmitted by the first cable transfer interface 110a to provide data to the PC 135 according to the interface format described above. In one embodiment, a 9-pin serial data port on the PC 135 can be used to transmit and receive data between the PC 135 and the second cable transfer interface 110c.

In the receive operation, data can be transmitted from the PC 135 to the set-top box 100a, such as when the PC 135 responds to the request transmitted by the set-top box 100a. In particular, data can be transmitted from the PC 135 to the second cable transfer interface 110c according to the interface format described above. The second cable transfer interface 110c can process the data to provide a second modulated data signal that is transmitted over the transmission line 130 to the first cable transfer interface 110a. The first cable transfer interface 110a demodulates the data received from the PC 135 and provides data to the set-top box 100a according to the interface format. The set-top box 100a uses the data to control the display of a distributed version of the television signal 127 on the television 102a provided to the set-top box 100a. In another embodiment, the same cable can be used to provide the distributed version of the television signal 127 and the data to the first cable transfer interface 110a and the set-top box 100a.

Accordingly, cabling installed in houses can be used to transfer data between devices, such as PCs and set-top boxes. For example, existing cabling can be used to connect a PC with a set-top box, thereby allowing data to be transferred between the set-top box and the PC. Moreover, the data transfer does not interfere with the television signal conducted over the same cable. The cabling can be installed in the floors and

walls of the house, thereby making the connection between the devices less cumbersome and less expensive than adding a dedicated cable between the devices.

**FIG. 12** is a block diagram of a cable transfer interface **110** according to the present invention. In a transmit operation the data formatted according to the interface format can be received by a converter **200** which converts the received data to Complementary Metal Oxide Semiconductor (CMOS) or Transistor to Transistor Logic (TTL) voltage levels (such as 0-5 volts) to provide a transmit format data signal. A transmitter **205** can process the transmit format data signal using Frequency Shift Keying (FSK) modulation to provide the transmit modulated data signal. The FSK modulation can be performed using a frequency range that is not within a television signal frequency range used to conduct the television signal **127** over the transmission line **130**. For example, in one embodiment the FSK modulation is performed using frequencies in a range between about 800KHz and 1MHz.

The transmit modulated data signal can be provided to a switch **210** that electrically couples the transmit modulated data signal to the transmission line **130** under the control of the data provided to the cable transfer interface **110**. For example, a Ready To Send (RTS) signal included in an RS-232 interface can be used to control the switch direction to electrically couple the transmit modulated data signal to the transmission line **130**.

The transmitter **205** can include an FSK modulator **220** that provides a modulated data signal using a frequency range that is not within the television signal frequency range used to conduct the television signal **127** over the transmission line **130**. The FSK modulator **220** generates the modulated data signal at a frequency based on information included in the transmit format data signal. For example, in one embodiment the FSK modulator **220** generates the modulated data signal at a frequency of 800KHz upon detecting that the transmit format data signal is equal to a logical 0. When the transmit format data signal transitions to a logical 1, the FSK modulator **220** generates the modulated data signal at a frequency of 1MHz.

The modulated data signal is provided to a transmit interface **225** that provides the transmit modulated data signal to the switch **210**. In particular, the transmit interface **225** drives the transmit modulated data signal over the transmission line **130** via the switch



210 to compensate for a variety of transmission line 130 configurations. For example, the transmit interface 225 may drive the transmit modulated data signal over a 200-foot transmission line 130 with an impedance in a range between about 25 ohms and 75 ohms.

5 In a receive operation data is transferred over the transmission line 130 to the switch 210 which electrically couples the data from the transmission line 130 to receiver 215 under the control of the data provided to the cable transfer interface 110 to provide a receive modulated data signal. For example, a Ready To Send (RTS) signal included in an RS-232 interface can be used to control the switch direction to electrically couple the data from the transmission line 130 to the receiver 215.

10 The receiver 215 processes the receive modulated data signal to provide a demodulated data signal to the converter 200. In particular, the receiver 215 processes the receive modulated data signal using FSK demodulation over a frequency range that is not within a television signal frequency range used to conduct the television signal 127 over the transmission line 130 to provide a receive format data signal.

15 The converter 200 converts the receive format data signal to the interface format as described above. For example, in one embodiment the receive format data signal can be converted from CMOS voltage levels to RS-232 voltage levels.

The receiver 205 can include a receive interface 230 that matches the impedance of the cable transfer interface 110 to the transmission line 130 to provide a receive  
20 modulated data signal. For example, in one embodiment, the receive interface 230 can provide a 75 ohm termination for the transmission line 130. The receiver 205 also includes an FSK demodulator 235 that provides a demodulated data signal using a frequency range that is not within the television signal frequency range used to conduct the television signal 127 over the transmission line 130 to provide the demodulator data  
25 signal. For example, in one embodiment the FSK demodulator 235 generates a logical 0 upon demodulating the modulated data signal at a frequency of 800KHz. The FSK demodulator 235 generates a logical 1 upon demodulating the modulation data signal at a frequency of 1Mhz.

30 FIG. 13 is a schematic diagram of an exemplary embodiment of a cable transfer interface 110 according to the present invention. According to FIG. 13, data can be transmitted to/from the cable transfer interface 110 via connector 300. The data is

converted to/from CMOS voltage levels from/to RS-232 voltage levels by an interface format chip 305 such as a MAX232CWE marketed by Maxim, Inc. The CMOS level data is processed by the FSK modulator 310 to provide a transmit modulated data signal. The FSK modulator 310 may be a Monolithic PLL XR0215ACD marketed by Exar, Inc.

5           The transmit modulated data signal is driven over the transmission line 130 by the transmit interface 225. The transmit interface 225 can include a transistor Q1 and resistors R14 and R15 in an emitter follower configuration. The emitter follower configuration can allow the transmit interface to drive the transmit modulated data signal over the transmission line 130 up to 200 feet at an impedance in the range of about 25  
10 ohms to 75 ohms.

          The transmit modulated data signal can be provided to a switch 320 which couples the transmit modulated data signal to the transmission line 130 during a transmit operation. The switch 320 may be an analog switch PI5A383AW marketed by Pericom, Inc. The switch 320 also can couple data from the transmission line 130 to FSK  
15 demodulator 325 via the receive interface 230 during a receive operation to provide the receive modulated data signal. The direction of the switch 320 is controlled by an RTS signal generated at pin 9 of the interface format chip 305. For example, the RTS signal indicates that a device is ready to send data. Accordingly, the direction of the switch 320 is set to receive data from the device sending the RTS signal.

20           The FSK demodulator 325 can demodulate the receive modulated data signal to provide a demodulated data signal. The FSK demodulator 325 may be a Monolithic PLL XR0215ACD marketed by Exar, Inc. The demodulated data signal may have an amplitude of about 200mV.

          The demodulated data signal can be compared to a reference voltage (controlled  
25 by potentiometer R32) by the comparator 330. The comparator 330 shifts the voltage level of the demodulated data signal to CMOS voltage levels to provide the receive format data signal. The comparator 330 may be a Voltage Comparator LM311M marketed by National Semiconductor, Inc. The receive format data signal is provided to the interface format chip 305 for conversion to RS-232 voltage levels upon which data is  
30 transmitted over the connector 300.

Accordingly, cabling installed in houses can be used to transfer data between devices, such as PCs and set-top boxes. For example, existing cabling can be used to connect a PC with a set-top box, thereby allowing data to be transferred between the set-top box and the PC. Moreover, the data transfer does not interfere with the television  
5 signal conducted over the same cable. The cabling can be installed in the floors and walls of the house, thereby making the connection between the devices less cumbersome and less expensive than adding a dedicated cable between the devices.

In addition, set-top boxes can be identified by respective IDs. The set-top boxes can send requests for information over a communications link to a PC. The requests can  
10 include the ID of the set-top box that made the request. When the requested information is accessed by the PC, the requested information and the ID of the set-top box that made the request are transmitted over the communications link to the set-top box. Accordingly, multiple set-top boxes may access information from a single residence via an existing PC, thereby allowing a more cost-effective approach than conventional systems.

15 In the drawings and specification, there have been disclosed typical preferred embodiments of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the following claims.

**What is Claimed is:**

1. A method of providing information from a personal computer to a set-top box over a television signal transmission line, the method comprising the steps of:  
receiving a request for information from the set-top box at the personal computer, wherein the request includes an ID that identifies the set-top box;  
5 accessing the requested information by the personal computer; and  
transmitting the requested information and the ID that identifies the set-top box from the personal computer to the set-top box over the television signal transmission line using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal over the television  
10 signal transmission line.
2. The method of Claim 1 further comprising the steps of:  
receiving a second request for second information from a second set-top box at the personal computer, wherein the second request includes a second ID that identifies the second set-top box;  
5 accessing the second requested information by the personal computer; and  
transmitting the second requested information and a second ID that identifies the second set-top box from the personal computer to the set-top box over the television signal transmission line using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal  
10 over the television signal transmission line.
3. The method of Claim 1, wherein the step of transmitting comprises the step of transmitting data from a first device to a second device over the television signal transmission line which simultaneously conducts a television signal.
4. The method of Claim 2, wherein the step of accessing comprises the steps of:

accessing the first requested information based on a first context associated with the first set-top box; and

- 5        accessing the second requested information based on a second context associated with the second set-top box.

5.        The method of Claim 3, wherein the step of transmitting comprises the steps of:

- generating a modulated data signal at a frequency that is based on the data; and  
             transmitting the modulated data signal from the first device to the second device  
5        over the television signal transmission line.

6.        The method of Claim 2, wherein the step of accessing comprises the steps of:

- combining the first request for information and the second request for information at the personal computer; and  
5        accessing the first requested information and the second requested information by the personal computer via a network.

7.        The method of Claim 4, wherein the step of accessing comprises the step of accessing the first requested information by the personal computer based on a first keyboard status and a first screen status.

8.        The method of Claim 1, wherein the step of transmitting comprises the step of broadcasting a plurality of information packets by the personal computer over the television signal transmission line using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television  
5        signal over the television signal transmission line.

9.        The method of Claim 1, wherein the step of accessing comprises the step of accessing the requested information by the personal computer via a network.

10. The method of Claim 1 further comprising the steps of:  
sending a power-up packet including the ID of the set-top box from the set-top box to the personal computer over the communications link from the set-top box;  
recording the ID of the set-top box included in the power-up packet at the  
5 personal computer to designate the set-top box as known; and  
transmitting an acknowledgement packet including the ID of the set-top box from the personal computer over the communications link to the set-top box to acknowledge receipt of the power-up packet from the set-top box.
11. A method of providing information to a set-top box over a communications link, the method comprising the steps of:  
receiving a request for information from the set-top box, wherein the request includes an ID that identifies the set-top box;  
5 accessing the requested information; and  
transmitting the requested information and the ID that identifies the set-top box over the communications link.
12. The method of Claim 11 further comprising the steps of:  
receiving a second request for second information from a second set-top box, wherein the second request includes a second ID that identifies the second set-top box;  
accessing the second requested information; and  
5 transmitting the second requested information and a second ID that identifies the second set-top box over the communications link.
13. A method of providing information from a personal computer to a set-top box over a communications link, the method comprising the steps of:  
receiving a request for information from the set-top box at the personal computer, wherein the request includes an ID that identifies the set-top box;  
5 accessing the requested information by the personal computer; and  
transmitting the requested information and the ID that identifies the set-top box from the personal computer to the set-top box over the communications link.

14. The method of Claim 13 further comprising the steps of:  
receiving a second request for second information from a second set-top box at the personal computer, wherein the second request includes a second ID that identifies the second set-top box;  
5 accessing the second requested information by the personal computer; and  
transmitting the second requested information and a second ID that identifies the second set-top box from the personal computer to the set-top box over the communications link.

15. The method of Claim 14, wherein the step of accessing comprises the steps of:  
accessing the first requested information based on a first context associated with the first set-top box; and  
5 accessing the second requested information based on a second context associated with the second set-top box.

16. The method of Claim 14, wherein the step of accessing comprises the steps of:  
combining the first request for information and the second request for information at the personal computer; and  
5 accessing the first requested information and the second requested information by the personal computer via a network.

17. The method of Claim 15, wherein the step of accessing comprises the step of accessing the first requested information by the personal computer based on a first keyboard status and a first screen status.

18. The method of Claim 13, wherein the step of transmitting comprises the step of broadcasting a plurality of information packets by the personal computer over the

communications link, wherein at least one of the information packets includes the ID that identifies the set-top box that requested the information.

19. The method of Claim 13, wherein the step of accessing comprises the step of accessing the requested information by the personal computer via a network.

20. The method of Claim 13 further comprising the steps of:  
sending a power-up packet including the ID of the set-top box from the set-top box to the personal computer over the communications link from the set-top box;  
recording the ID of the set-top box included in the power-up packet at the  
5 personal computer to designate the set-top box as known; and  
transmitting an acknowledgement packet including the ID of the set-top box from the personal computer over the communications link to the set-top box to acknowledge receipt of the power-up packet from the set-top box.

21. A set-top box that interfaces to a television and requests information from a personal computer over a communications link, wherein the set-top box is identified by an associated set-top box ID, wherein the set-top box transmits requests for information and the set-top box ID to the personal computer and receives the information and an  
5 associated ID from the PC over the communications link.

22. The set-top box of Claim 21, wherein the set-top box accepts the information from the personal computer if the received associated ID identifies the set-top box.

23. The set-top box of Claim 22, wherein the set-top box rejects the information transmitted by the personal computer if the received associated ID does not identify the set-top box.

24. The set-top box of Claim 21, wherein the communications link is a coaxial cable.



25. The set-top box of Claim 21, wherein the set-top box is configured to be coupled to the personal computer in a house.

26. A system that provides information over a communications link, the system comprising:

5 a set-top box, configured to be coupled to a television, wherein the set-top box transmits requests for information intended for display on the television, wherein the set-top box has an associated ID that identifies the set-top box; and

a personal computer, configured to be coupled to a network and to the set-top box via the communications link, wherein the personal computer receives the requests for information from the set-top box, accesses the requested information and transmits the requested information and the ID associated with the set-top box to the set-top box.

27. The system of Claim 26, wherein the personal computer receives second requests for information from a second set-top box, wherein the second requests include a second associated ID that identifies the second set-top box, and wherein the personal computer accesses the second requested information and transmits the second requested information and the second ID associated with the second set-top box to the second set-top box.

28. The system of Claim 27, wherein the personal computer accesses the first requested information based on a first context associated with the first set-top box and accesses the second requested information based on a second context associated with the second set-top box.

5

29. The system of Claim 27, wherein personal computer combines the first request for information and the second request for information and accesses the first requested information and the second requested information via a network.

30. The system of Claim 28, wherein the personal computer accesses the first requested information based on a first keyboard status and a first screen status.

31. The system of Claim 26, wherein the personal computer broadcasts a plurality of information packets over the communication link, wherein at least one of the information packets includes the ID that identifies the set-top box that requested the information.

32. The system of Claim 26, wherein the personal computer accesses the requested information via a network if the personal computer determines that the requested information is not stored on the personal computer.

33. A method of transferring data over a television signal transmission line comprising the step of:

transferring the data using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal  
5 over the television signal transmission line.

34. The method of Claim 33, wherein the step of transferring comprises the step of transmitting the data from a first device to a second device over the television signal transmission line which simultaneously conducts a television signal.

35. The method of Claim 33, wherein the step of transferring comprises the step of receiving the data from the television signal transmission line which simultaneously conducts a television signal.

36. The method of Claim 34, wherein the step of transmitting comprises the steps of:

generating a modulated data signal at a frequency that is based on information included in the data; and

- 5           transmitting the modulated data signal from the first device to the second device over the television signal transmission line.

37.     The method of Claim 34, wherein the step of transmitting comprises the steps of:

- converting an interface format data signal to an internal format data signal;  
          generating a modulated data signal at a frequency based on information included  
5   in the internal format data signal;  
          driving the modulated data signal to compensate for a characteristic impedance of the television signal transmission line to provide a buffered modulated data signal; and  
          setting a switch direction that electrically couples the buffered modulated data signal to the television signal transmission line.

38.     The method of Claim 35, wherein the step of receiving comprises the steps of:

- setting a switch direction that electrically couples the data from the television signal transmission line to provide a buffered modulated data signal;  
5       receiving the buffered modulated data signal to compensate for a characteristic impedance of the television signal transmission line;  
          generating an internal format data signal from the buffered modulated data signal using frequency shift keying demodulation based on a frequency of the buffered modulated data signal; and  
10       converting the internal format data signal to an interface format data signal.

39.     The method of Claim 33, wherein the step of transferring comprises the step of transferring the data from a first device in a residence to a second device in the residence.

40.     The method of Claim 33, wherein the step of transferring comprises the step of transferring data over a coaxial cable.

41. A method of communicating in a residence via cable installed in the house, the method comprising the step of:

transferring data over the installed cable using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct  
5 the television signal over a television signal transmission line.

42. The method of Claim 41, wherein the step of transferring comprises the step of transmitting the data from a first device to a second device over the installed cable which simultaneously conducts a television signal.

43. The method of Claim 41, wherein the step of transferring comprises the step of receiving the data from the installed cable which simultaneously conducts a television signal.

44. The method of Claim 42, wherein the step of transmitting comprises the steps of:

converting an interface format data signal to an internal format data signal;  
generating a modulated data signal at a frequency based on information included  
5 in the internal format data signal;  
driving the modulated data signal to compensate for a characteristic impedance of the installed cable to provide a buffered modulated data signal; and  
setting a switch direction that electrically couples the buffered modulated data signal to the installed cable.

45. The method of Claim 43, wherein the step of receiving comprises the steps of:

setting a switch direction that electrically couples the data from the installed cable to provide a buffered modulated data signal;  
5 receiving the buffered modulated data signal to compensate for a characteristic impedance of the installed cable;

- generating an internal format data signal from the buffered modulated data signal using frequency shift keying demodulation based on a frequency of the buffered modulated data signal; and
- 10        converting the internal format data signal to an interface format data signal.

46.     A cable transfer interface circuit that processes data using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to transmit the television signal over a television signal transmission line.

47.     The cable transfer interface circuit of Claim 46, wherein the frequency range is about 800KHz to 1MHz.

48.     The cable transfer interface circuit of Claim 46, wherein the television signal transmission line is a coaxial cable.

49.     The cable transfer interface circuit of Claim 46, wherein the data is transmitted from a first device in a building to a second device in the building over the television signal transmission line.

50.     A cable transfer interface circuit that transmits data from a data interface over a television signal transmission line during a transmit operation and that provides data from the television signal transmission line to the data interface during a receive operation, the data interface circuit comprising:

- 5        a converter that converts a first interface format data signal from the data interface to a transmit format data signal during the transmit operation;
- a transmitter, responsive to the converter, that provides a transmit modulated data signal based on the transmit format data signal using frequency shift keying during the transmit operation in a frequency range that is not within a television signal frequency
- 10       range used to conduct the television signal over the television signal transmission line;

a switch, responsive to the transmitter, that electrically couples the transmit modulated data signal to the television signal transmission line during the transmit operation;

wherein the switch electrically couples data from the television signal  
15 transmission line to provide a receive modulated data signal during the receive operation;

a receiver, responsive to the switch, that provides a receive format data signal based on the receive modulated data signal to the converter interface during the receive portion using frequency shift keying demodulation in the frequency range that is not within the television signal frequency range used to conduct the television signal over the  
20 television signal transmission line; and

wherein the converter converts the receive format data signal to a second interface format data signal during the receive operation.

51. The cable transfer interface circuit of Claim 50, wherein the transmitter comprises:

a frequency shift keying modulator that generates a modulated data signal based on information included in the first interface format data signal; and

5 a transmit interface, responsive to the frequency shift keying modulator, that transmits the transmit modulated data signal over the television signal transmission line via the switch based on the modulated data signal, wherein the television signal transmission line has an impedance in a range between about 75 ohms and 25 ohms.

52. The cable transfer interface circuit of Claim 50, wherein the receiver comprises

a receive interface that receives data from the television signal transmission line to provide a modulated data signal;

5 a frequency shift keying demodulator, responsive to the receive interface, that demodulates the modulated data signal to provide a demodulated data signal; and

a level shifter, responsive to the frequency shift keying demodulator, that shifts a voltage level of the demodulated outer signal to provide the receive format data signal.

53. The cable transfer interface circuit of Claim 50, wherein the television signal transmission line is a coaxial cable.

54. The cable transfer interface circuit of Claim 50, wherein the transmitter is located in a building; and wherein data is transmitted over the television signal transmission line to a device in the building.

55. The cable transfer interface circuit of Claim 50, wherein the frequency range is between about 800KHz and 1 MHz.

56. A system for transferring data in a residence, the system comprising:  
a cable, installed in the residence, that conducts a television signal and data transfers simultaneously;

5 a first cable transfer interface, electrically connected to the installed cable, that transfers data over the installed cable using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal over the installed cable;

10 a set-top box, electrically connected to the first cable transfer interface, that transfers data to the first cable transfer interface in response to input and distributes a video signal;

a second cable transfer interface, electrically connected to the installed cable, that transfers data over the installed cable using frequency shift keying modulation in the frequency range that is not within the television signal frequency range used to conduct the television signal over the installed cable;

15 a personal computer, electrically connected to the second cable transfer interface, that transfers data to the second cable transfer interface in response to transfers from the set-top box;

a television, responsive to the set-top box, that displays the video signal; and

20 a video cassette recorder electrically connected to the installed cable, that records the television signal and provides a recorded video signal to the television.

57. The system of Claim 56, wherein the frequency range is about 800KHz to 1MHz.

58. The system of Claim 57, wherein the cable is a coaxial cable.

59. A system for transferring data in a residence, the system comprising:  
a cable, installed in the residence, that conducts a television signal and data transfers simultaneously;

a first cable transfer interface, electrically connected to the installed cable, that  
5 transfers data over the installed cable using frequency shift keying modulation in a frequency range that is not within a television signal frequency range used to conduct the television signal over the installed cable;

a set-top box, electrically connected to the first cable transfer interface, that transfers data to the first cable transfer interface in response to input and distributes a  
10 video signal;

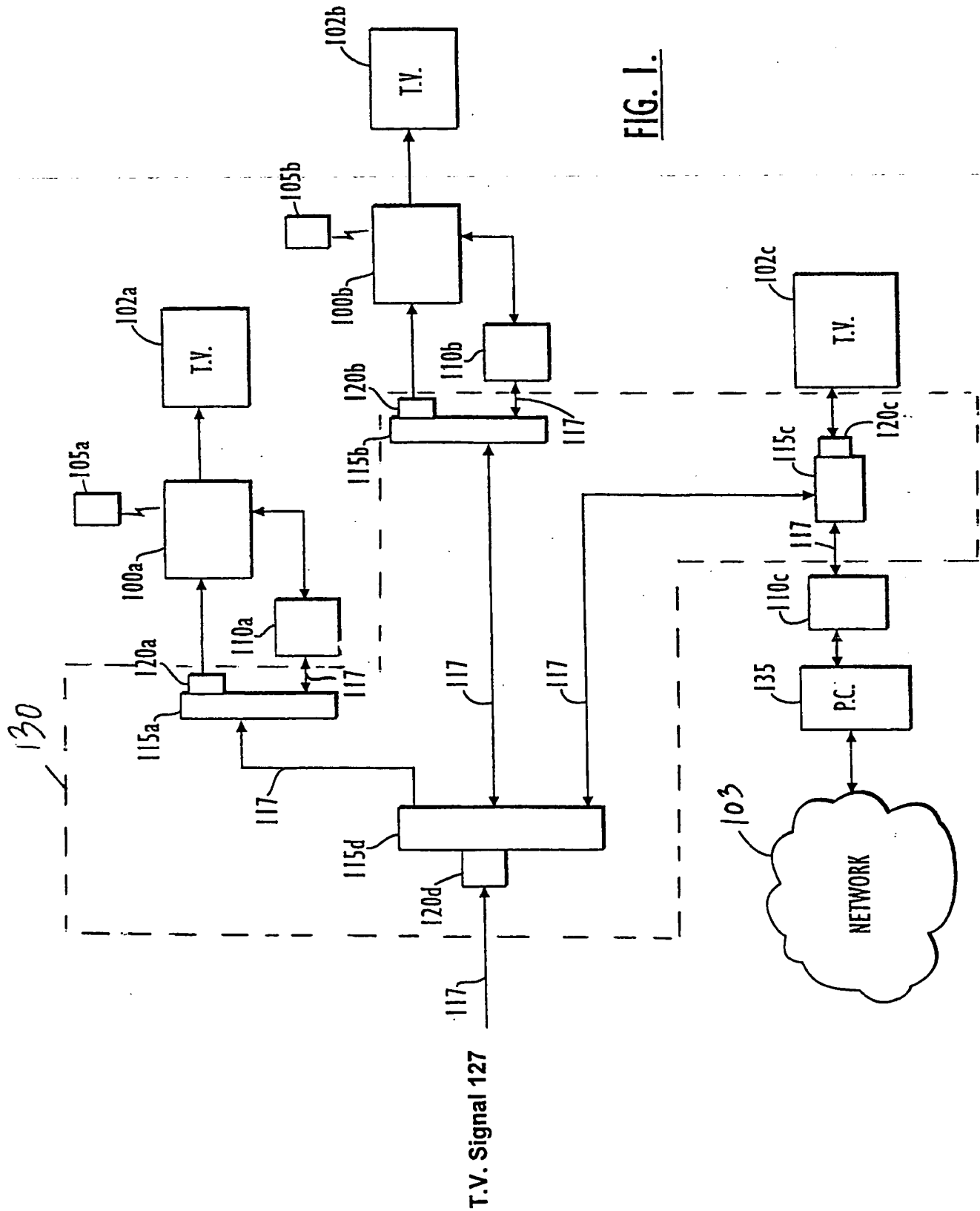
a second cable transfer interface, electrically connected to the installed cable, that transfers data over the installed cable using frequency shift keying modulation in the frequency range that is not within the television signal frequency range used to conduct the television signal over the installed cable; and

15 a personal computer, electrically connected to the second cable transfer interface, that transfers data to the second cable transfer interface in response to transfers from the set-top box.

60. The system of Claim 58, wherein the frequency range is about 800KHz to 1MHz.

61. The system of Claim 58, wherein the cable is a coaxial cable.



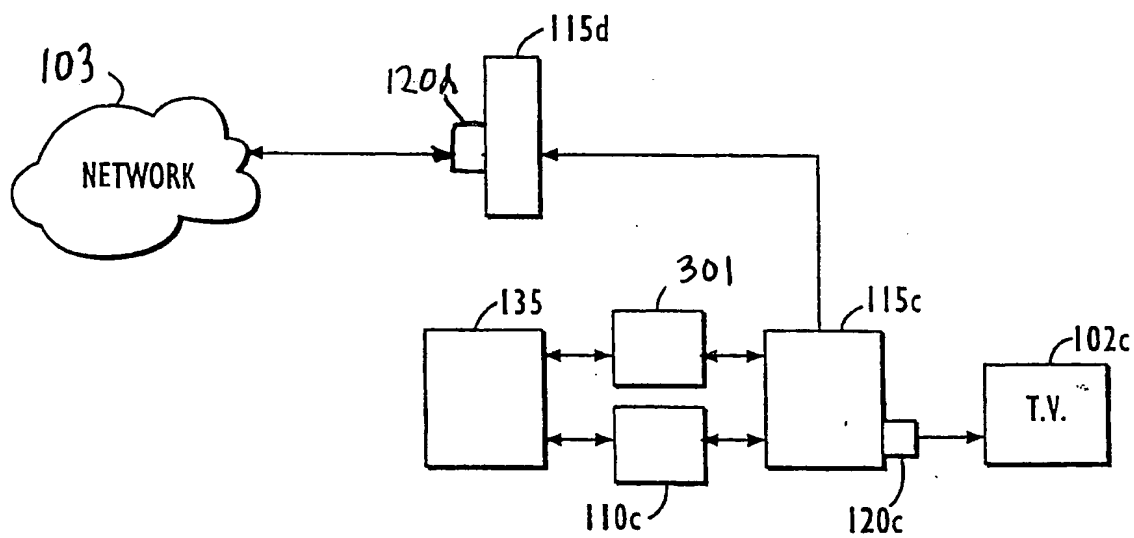


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CBS	DIAGNOSIS MURDER		MALONEY
NBC	FRIENDS	SINGLE GUY	SEINFELD
FOX	<<MAJOR LEAGUE BASEBALL PLAYOFFS NLCS GAME 7>>		
SCFI	STAR TREK V: THE FINAL FRONTIER (SCI FI***)>>		
HBO	<<FRENCH KISS(COM**)		THE NET (SUS**)>>
CNN	PRIME NEWS	POLITICS	LARRY KING LIVE>>
TBS	<<WHO'S THE MAN(COM-DRA**)		NATIONAL GEOGRAPHIC
USA	MURDER SHE WROTE		CAPE FEAR>>
TWC	WEATHER SCOPE	5-DAY PLANNER	MICHELIN DRIVER'S
<div>CURRENT</div> <div>FAVORITES</div> <div>OPTIONS</div> <div>TH 10/10 8:04PM</div>			

FIG. 2.

FIG. 3.

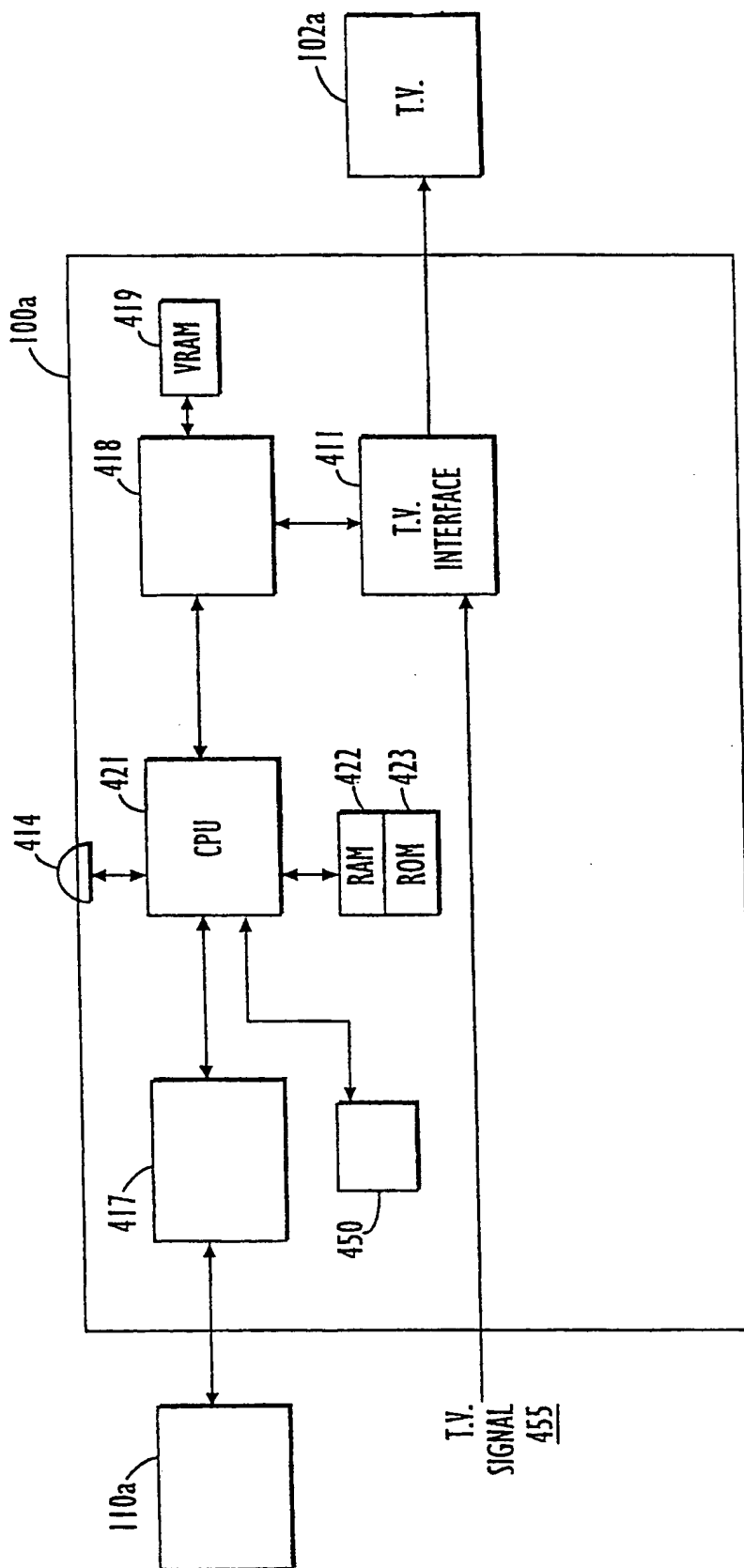


FIG. 4.

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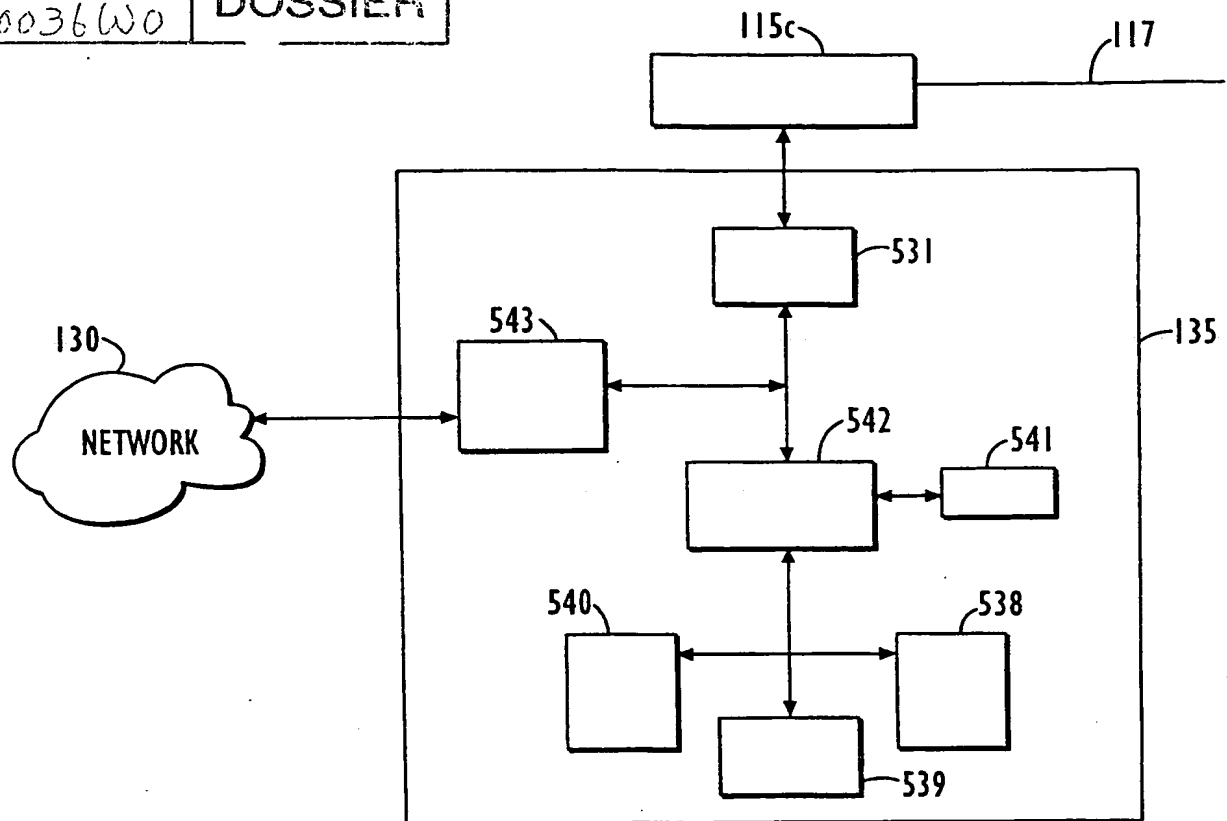


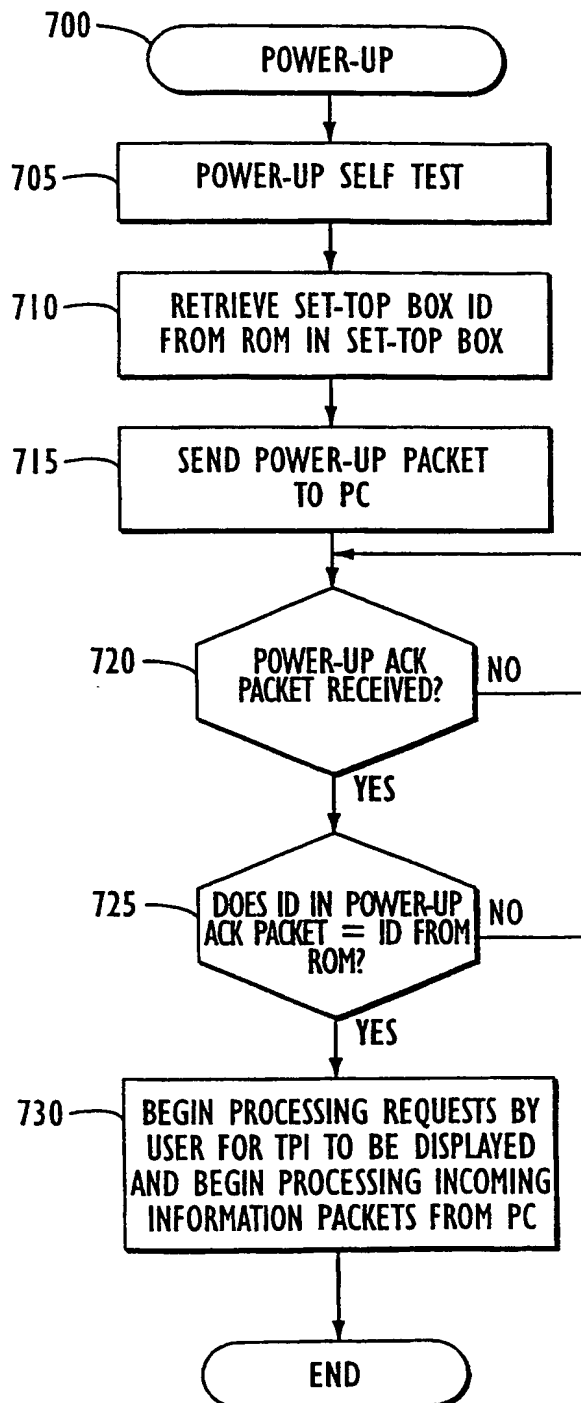
FIG. 5.

**PACKET FORMAT**

START	ID	INSTR	LENGTH	[DATA]	CKSUM	STOP
BYTE	WORD	BYTE	WORD	nBYTES	WORD	BYTE

FIG. 6.

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FIG. 7.

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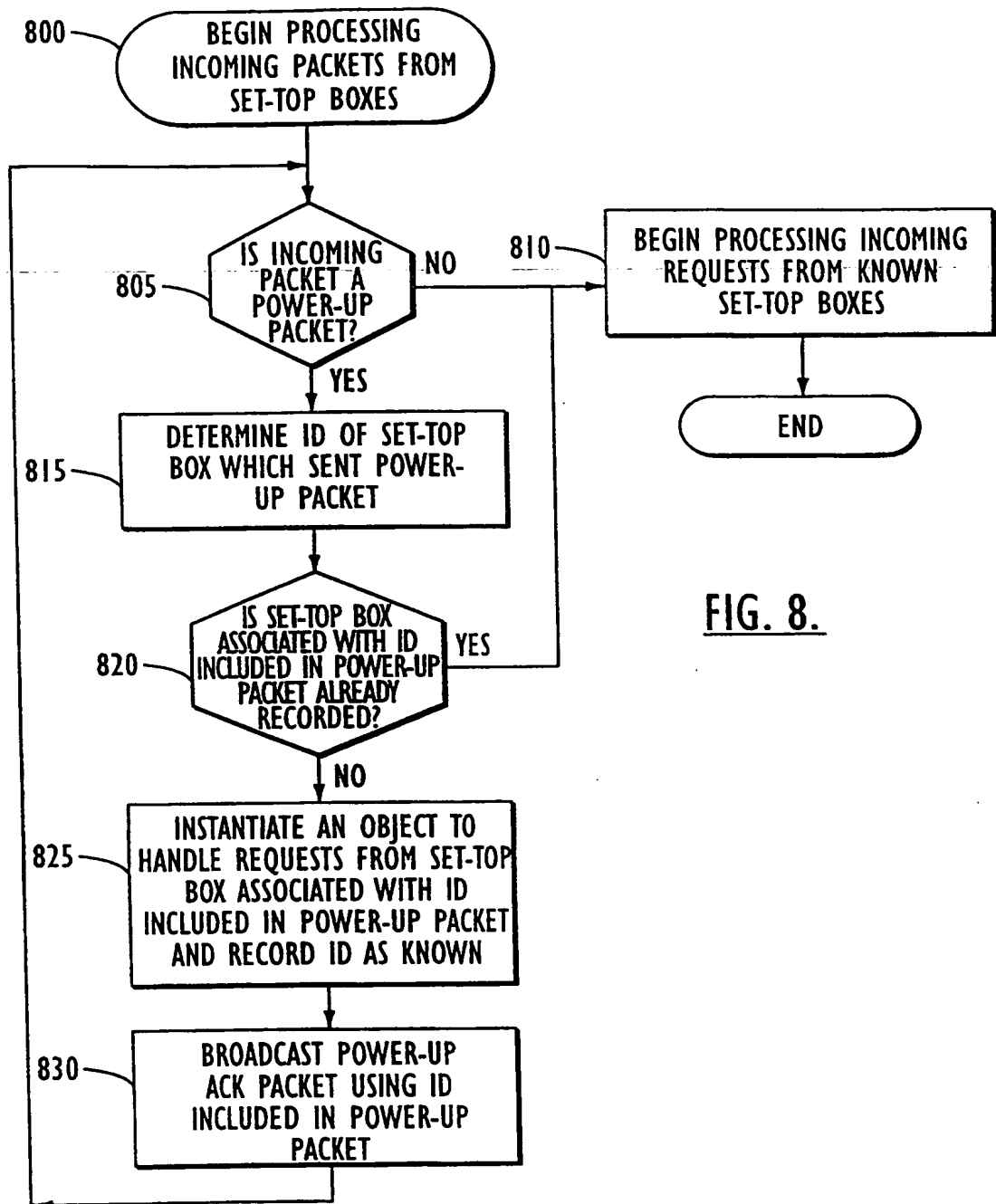
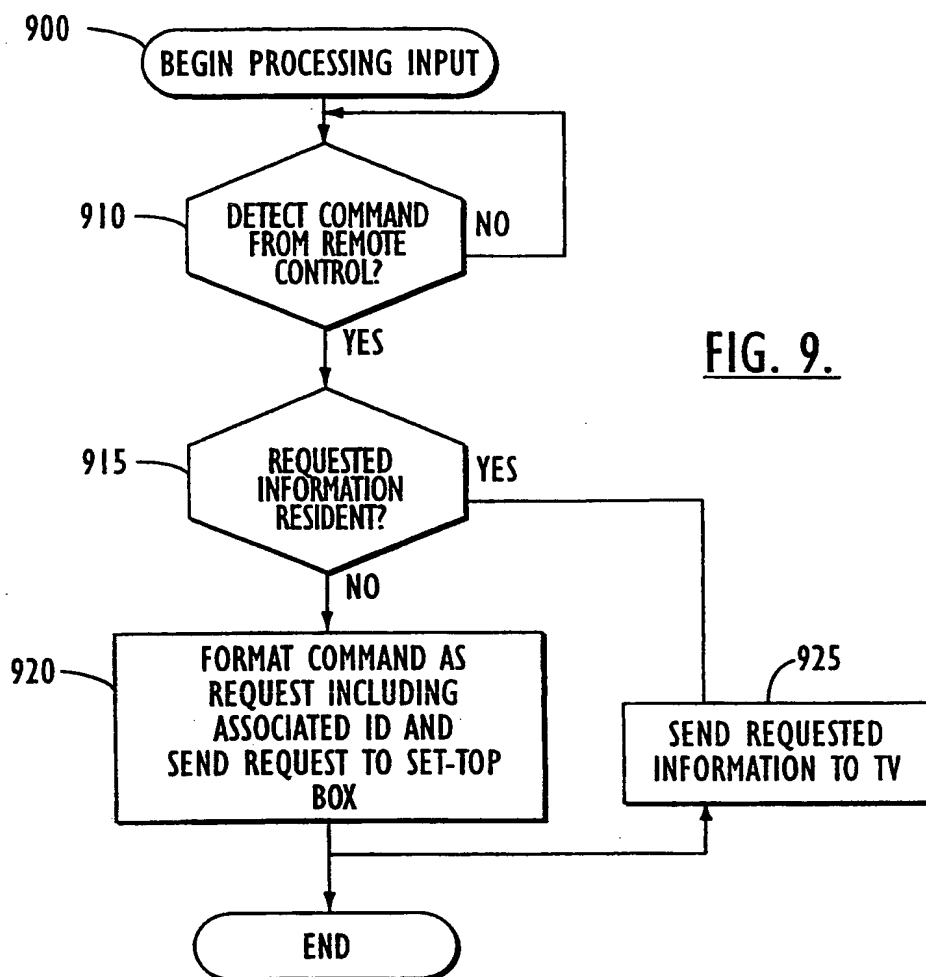


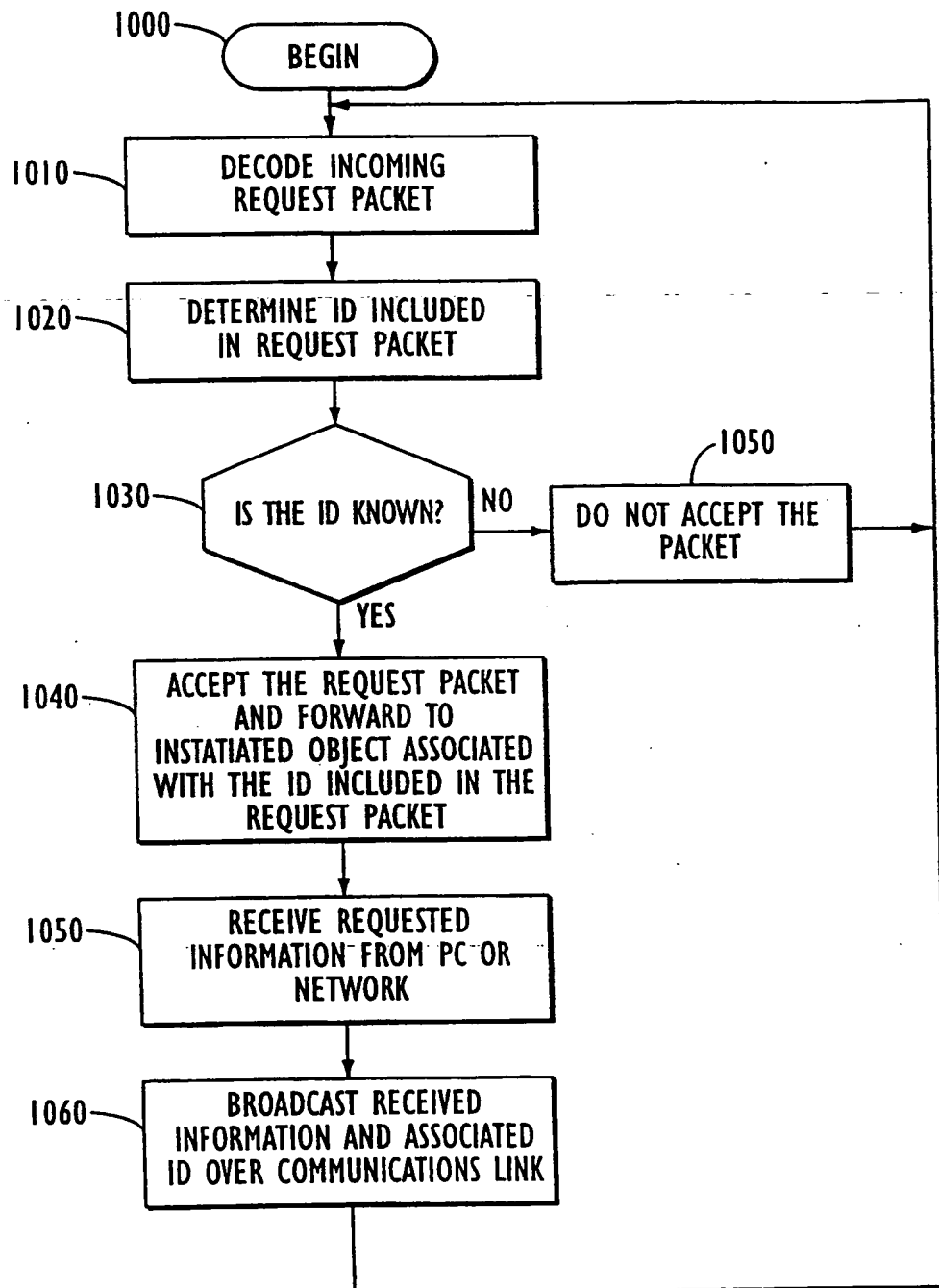
FIG. 8.

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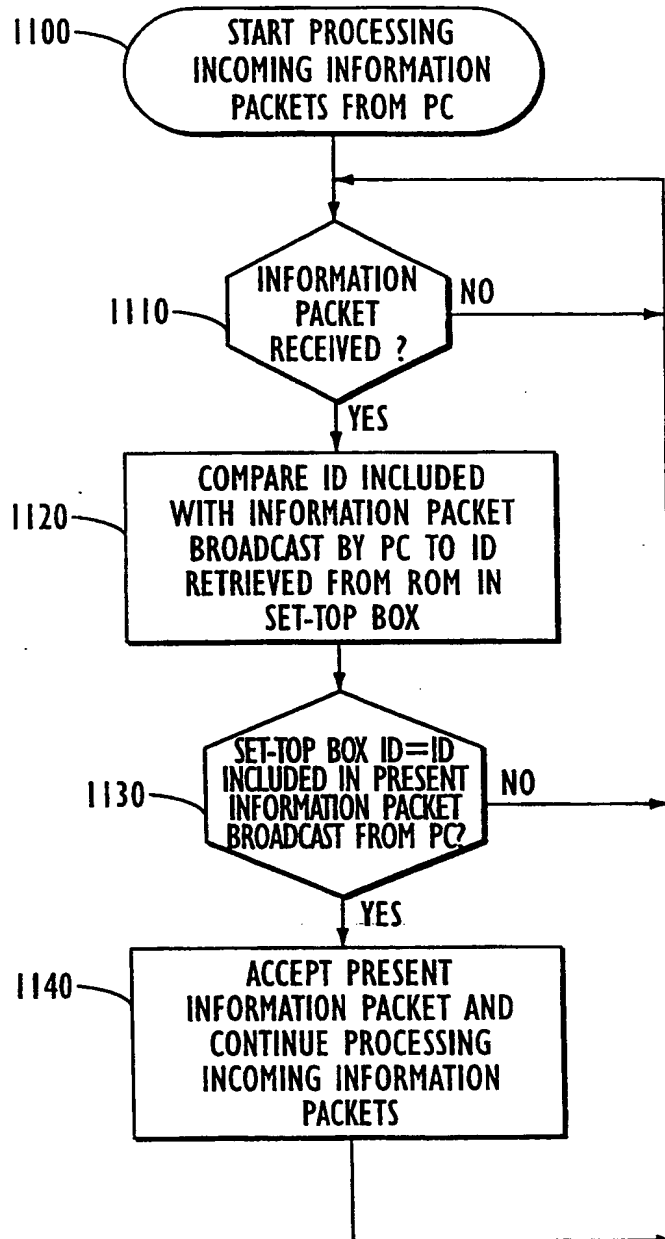




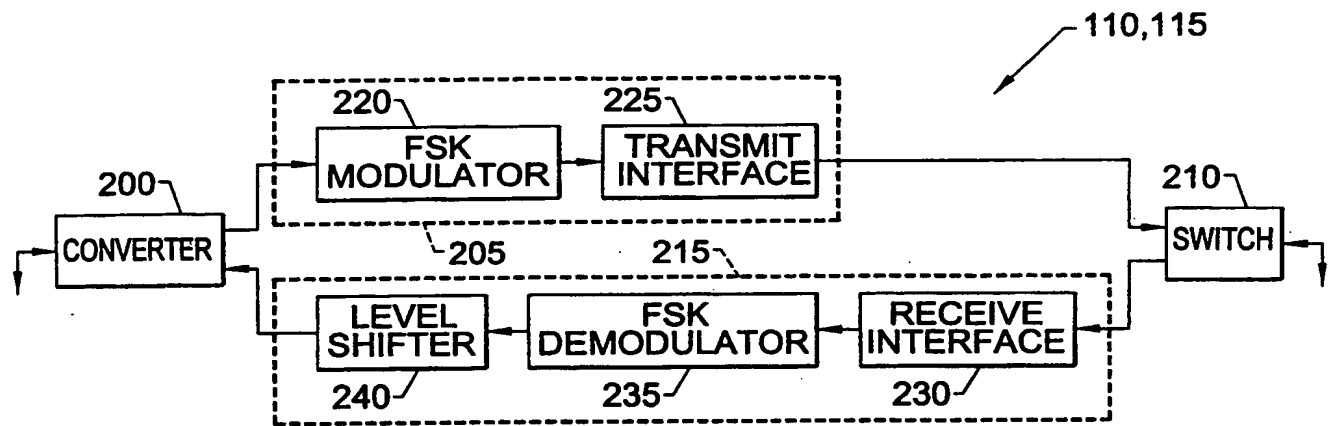
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FIG. 10.

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FIG. 11.

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FIG. 12.

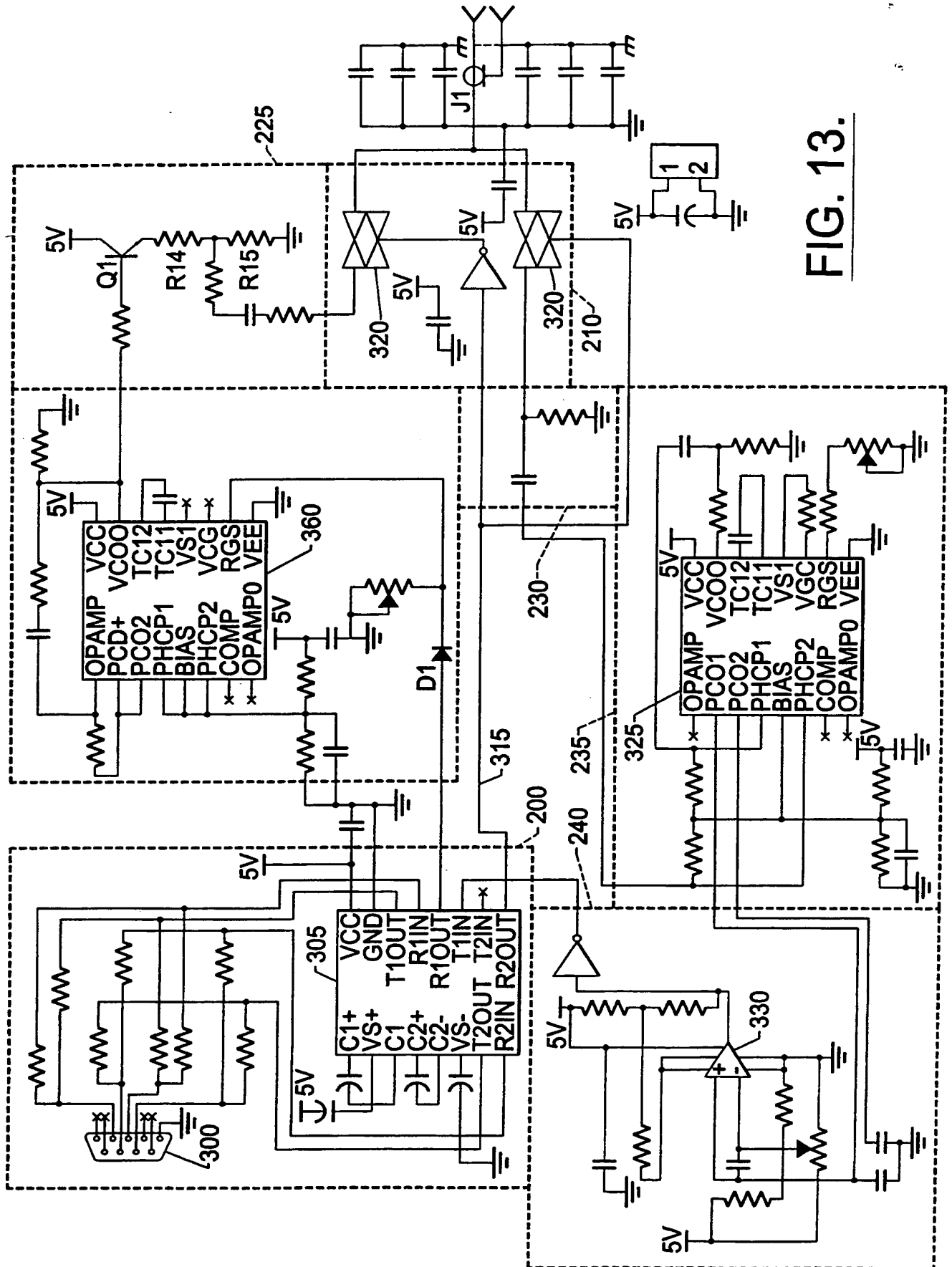


FIG. 13.

# INTERNATIONAL SEARCH REPORT

Internat. Application No

PCT/US 00/02303

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04N7/24

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>US 5 255 086 A (MCMULLAN JR JAY C ET AL)  19 October 1993 (1993-10-19)  column 5, line 22 -column 7, line 13  column 10, line 15 -column 11, line 32  column 13, line 29 - line 47  abstract; figures 1,3</p> <p>---  -/--</p>	1-61

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

5 July 2000

Date of mailing of the international search report

13/07/2000

Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

Internatio Application No  
PCT/US 00/02303

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A	page 3, line 47 -page 5, line 5 page 11, line 56 -page 12, line 6 page 18, line 7 -page 20, line 49 abstract; figures 1,10	4,7,15, 17,28, 30,37, 38,44, 45,50-61
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A	abstract; claim 1; figure 5	2-10,12, 14-20, 22-25, 27-61
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A	abstract; figure 1 column 5, line 37 - line 49 column 11, line 23 - line 29 column 12, line 21 - line 27	1-32,37, 38,44, 45,50-61
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A	WO 98 03012 A (SCHULTHEISS CHRISTOPHER J ;BROWN DOUGLAS G (US)) 22 January 1998 (1998-01-22)	1-61
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## G.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	EP 0 727 909 A (SONY CORP) 21 August 1996 (1996-08-21) abstract; figure 1 -----	1-61

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